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STERILITY IN DAIRY COWS.

Address to the South-West Conference, June, 1930, by E. F. TWADDLE, M.R.C.V.S.

Sterility in dairy cows may be defined as the inability of a sexually mature animal to conceive after being served repeatedly when on heat by a bull which is know to be fertile.

Here it is intended to discuss briefly the causes which, acting on the genital organs of the cow, produce sterility, either of a temporary or permanent nature. These are:—

CHRONIC INFLAMMATION OF THE WOMB.

Chronic inflammation of the womb in dairy stock which have been bred from and subsequently become sterile is very frequent. The disease is often insidious in its onset, and no symptoms of derangement may be noticed in the affected animal until the cows fail to conceive after returning repeatedly to the bull.

Cause.—Inflammation of the womb in cows is caused by infection of the womb with micro-organisms. The most opportune time for infection to take place is at or immediately after calving time, as the womb is then open to external influences, and the introduction of infective material from outside the animal's body is an easy matter.

Symptoms.—As the inflammation present is very often of a mild catarrhal nature, no definite symptoms of the trouble will be detected unless a careful examination is made of the affected womb. The cows appears in normal health and condition, but fails to get in calf. On the other hand when the infection of the womb is more virulent there will be present a muco-purulent discharge, which is particularly noticeable during heat periods when the mouth of the womb dilates slightly. In some cases it is constantly present even in between heat periods a discharge of pus from the inflamed womb. This discharge is often so great as to soil the tail and buttocks of affected cows. When the discharge is great a general appearance of unthriftiness in addition to sterility ensues.

Course of the disease.—The disease of the womb following inflammation will at times disappear spontaneously and the animal returns to normal condition to conceive at a subsequent heat, but in a great number of cases the inflammation spreads from the body of the womb in involve in turn the fallopian tubes and ovaries. In consequence the fallopian tubes become blocked and the ovum generated in the ovary is prevented from reaching the site of fertilization. When the infection reaches the ovaries these undergo degeneration and numerous cysts form in the substance on the surface of the ovaries. When the fallopian tubes and ovaries become involved the prospects of getting the cow in calf are not bright and the treatment necessary in those cases becomes prolonged and technical.

Prevention of inflammation of the womb.—It is in the matter of prevention of this condition that the stock owner has an important role to play because in preventing the onset of the affection he is also preventing the appearance of a state of sterility amongst his dairy stock. Inflammation of the womb in a great number of instances may be traced to neglect of ordinary hygienic principles in regard to treatment of in-calf dairy stock. The following points should be observed by all whose attention is directed towards the management of the dairy herd:—

(1) Cows housed or paddocked immediately prior to calving should be placed in the most hygienic surroundings possible. If housed the shed should be properly cleaned before the cow about to calve is allowed in. It is advisable to spray the walls, floor and fittings with a disinfectant solution—1 part lysol to 160 parts of water will make a reliable disinfectant solution for this purpose. A clean bed should be provided for the cow, hay or straw will serve this purpose provided that it is clean. If the bedding used is dusty it is advisable to allay the dust by sprinkling lightly with the disinfectant solution as used on the shed structure. Cows should not be allowed to calve down in paddocks which are covered with the droppings of other cows, as infection from manure may be carried by flies and deposited on the genital organs of the newly calved cow. During the summer months when the manure becomes dried and pulverized the wind will act as an agent to spread the contamination from the dirty ground surfaces of the paddocks on to the tail and back passages of cows allowed to lie in such surroundings. These precautions are especially necessary during the first three days after calving as then the womb is partially open and infection is likely to gain entrance and set up inflammation.

(2) In the event of it being necessary to render assistance to cows at calving time the person undertaking the task should use every care as regards his hands, arms, and any instruments or appliances required. Finger nails should be clipped short and cleaned, hands and arms washed thoroughly in a disinfectant solution—lysol 1 to 160 in water, *i.e.*, lysol one teaspoonful to every pint of water required. Any instruments or ropes required should be sterilized by boiling for 15 minutes prior to use and kept till required for use immersed in a disinfectant solution. The tail and back parts of the cow should be washed down with soap and water and sprayed with a disinfectant solution before proceeding to introduce the hand into the genital passage. Care should also be observed that manure passed by the animal in straining during the operation is not introduced with the arm—this may be obviated by an assistant ready to wash and disinfect the arm of the operator should contamination occur.

(3) *Retention of the afterbirth.*—This is frequent among animals that calve prematurely and is also met with frequently in cows which calve after the normal

period of gestation. The membranes do not separate completely from the inside surface of the womb, and the muscular walls of the womb fail to contract and produce separation and expulsion as should occur normally. When the afterbirth in the cow is not expelled within the first 24 hours after calving measures should be taken to affect and assist its removal. It is not a good policy to tear out the retained membranes forcibly, as in this process the womb is likely to be wounded and infection of the wounds is very probable. If the retained afterbirth is not removed with moderate traction a better policy is to fill up the womb with disinfectant solution by means of a proper syringe. A suitable disinfectant for this purpose is corrosive sublimate, 1 in 5,000 parts of water. The solution should be used at blood heat, an amount of one gallon being used for each douche. Should the animal strain and expel the fluid introduced whilst the operation is proceeding this is to be allowed and when the expulsion of the fluid has ceased for the time being the douching may be proceeded with. In this way infection of the womb from decomposing afterbirth will to a great extent be prevented and at the same time the effect of the fluid in the womb induces it to contract and expel the retained afterbirth. Douching should be carried out three times daily till the membranes come away and afterwards twice daily till all discharge has ceased. Care must be exercised with the syringe used, it is advisable to boil it for ten minutes before using each time. Isolation of a cow with retained membranes is advisable, as the discharges from the womb are certain to be septic to a great extent and it is possible to have infection spread from this source to other animals in the herd which are susceptible.

(4) Care and perseverance should be adopted in the treatment of all cases of a suppurative character which may occur amongst cows in a herd. Wounds which become septic should be treated antiseptically until healing takes place. If the discharge from septic wounds is great in addition to treatment the animal affected should be isolated. This precaution is also necessary in cases of inflammation of the udder where there is an abscess formation in the udder tissue and the pus formed comes away through the teat duct on stripping and through the udder wall when the abscess bursts externally.

CONTAGIOUS ABORTION.

Contagious abortion is an infection disease and is due to a specific micro-organism. The disease is a powerful predisposing factor in the production of sterility and every care should be exercised by stock owners to limit the spread of this disease. Full information as to symptoms, diagnosis, and treatment may be had by referring to the leaflet issued by the Department of Agriculture on this disease.

VAGINITIS.

Vaginitis.—Inflammation of the vagina—(the vagina is the passage which leads from the mouth of the womb to the exterior). This passage is frequently the seat of inflammation. When the inflammation of the vagina is acute, the affected animal will show symptoms of the irritation by frequent straining and frequent passing of urine. Very often the inflammation is accompanied by pus formation in which case a more or less purulent or muco-purulent discharge is present, the pus being expelled during the act of straining. In this condition the amount of pus discharged is very often so small as to escape notice unless a close examination is made.

Vaginitis can be caused by careless methods adopted in assisting the cow to calve, such as wounding the passage lining which is very sensitive and intro-

ducing infection into the vagina at this time by unclean hands or instruments. Again it may exist in a dairy herd in the form of an infectious disease when several cases will then appear. From this point of view of sterility the latter form is the more serious as the bull will act as an agent in the spread of the trouble. In the contagious form the lining membrane of the vagina in affected animals will be reddened and studded with numerous small pimple-like enlargements, a purulent discharge will also be present and in the acute stages straining will be evidenced by the affected animal after service by the bull or on passing urine. The inflamed membrane can be easily made to bleed so that the discharge from an affected cow will often be found to be blood stained.

This disease when present in a dairy herd will prevent conception in affected animals. The disease is more common in maiden heifers than older cows.

Treatment.—Affected animals should be isolated and douched with an antiseptic solution—corrosive sublimate in water—1 in 2,500 parts of water. Douching should be carried out twice daily until the acute symptoms subside.

To prevent the disease spreading the bull should not be allowed to serve cows which are infected. If it happens that the bull has had contact with affected animals the hairs at the opening of the bull's sheath require to be clipped short and the sheath syringed out with the solution as recommended in the case of cows so affected.

TUBERCULOSIS.

When tuberculosis of the genital organs in the cow is the cause of sterility—treatment is out of the question. Prevention of this disease by slaughtering affected animals in a dairy herd is the best measure to take in such cases.

ACIDITY OF THE VAGINA.

Where acidity of the vaginal secretion is present in a dairy cow the service of the bull is effectively negatived. An acid state of the vaginal secretion in the cow does not give rise to any definite symptoms, and its presence will only be detected on a test being made for acidity by means of litmus paper or other chemical tests. Treatment when this condition is diagnosed douching of the vaginal passage with a solution of bicarbonate of soda—one ounce dissolved in a pint of water—will neutralize the acid present. This should be done daily for three days before the onset of heat, and on the day of service one hour before the cow is allowed to the bull.

STOMACH WORMS IN SHEEP.

Address to the South-West Conference, June, 1930, by E. F. TWADDLE, M.R.C.V.S.

The adult stomach worm of the sheep is found in the abomasum or 4th division of the sheep's stomach. Here in a badly infested animal the worms will be found in enormous numbers, either mixed with the ingesta of the stomach or adhering to the lining membrane of the stomach wall.

Life History.

After copulation has taken place within the stomach of an infested sheep fertilized eggs are laid by the female worm and passed out with the droppings

of the sheep onto the pasture. On the pasture the worm eggs—under suitable conditions of temperature and moisture—will hatch out within a period of twenty-four hours. The small embryos which thus come to life on the pasture moult twice during the first three weeks of life and having moulted are ready to infest and re-infest sheep on being taken into the alimentary tract with the food. On being taken up with the food of the sheep and reaching the stomach the immature worm continues to develop for a period of two or three weeks after which the adult sexually mature worm is developed and the next generation of worms is started. Thus in a period of six weeks the third generation of stomach worms come to life.

The size of the adult stomach worm varies from one-third to half an inch in length.

Symptoms.

Sheep which are not badly infested with worms show no marked symptoms of the trouble, but where heavy infestation occurs the affected sheep rapidly lose condition, and appetite, and progressive weakening of the affected animal and diarrhoea of a spasmodic nature sets in. As the condition progresses symptoms of anaemia with puffy swellings under the jaws appear, and finally death takes place when the sheep reaches the last stages of exhaustion due to the anaemia caused by large numbers of the parasites present in the stomach.

In sheep which die from worm infestation post mortem examination of the animal reveals the chief changes to be present in the 4th compartment of the stomach and that portion of the small bowel which leads directly from the stomach. In very acute cases the carcase will be found to be very well nourished. The liquid contents of the 4th stomach reveal great numbers of small worms.

Treatment.

In outbreaks in sheep the sheep should if possible be removed from the affected pastures so as to reduce further infestation. As older sheep often harbour the parasites without showing any marked symptoms, lambs should not be pastured over the same paddocks as the older sheep after weaning. Moist pastures are more dangerous to sheep in this matter than those which are comparatively dry—proper drainage of all pastures used by sheep will in a great measure prevent serious infestation of the ground with worms.

In districts where the trouble is serious all sheep and lambs should be dosed three times every season with a solution of copper sulphate and better with a mixture of a solution of copper sulphate and mustard. This medicine is prepared in the following manner:—Take ¼lb. of crystals of copper sulphate (blue stone) and dissolve in a pint of boiling water, take also ¼lb. of mustard and mix thoroughly with sufficient water till the mixture is thoroughly fluid, then mix the copper sulphate solution and mustard mixture together and make up to three gallons with water. using earthenware vessels for preparing and containing the mixture. Prior to dosing, the sheep should be starved for a period of 12 hours. Dose:—Lambs, 3 to 6 months, ½oz.; 6 to 9 months, 1oz.; 9 to 12 months, 1½oz. Sheep, over 12 months, 2oz. to 3oz.

In addition to drenching, sheep which are weakened through the effects of the parasites. should be allowed a liberal supply of concentrated food in addition to the pasture, such as oats, crushed or whole.

FIELD PEAS AS A ROTATION CROP IN THE SOUTH-WEST.

Address to the South-West Conference, June, 1930.

J. H. BRETT, Dardanup.

Many years ago there existed a feeling of pessimism and depression associated with the belief that a large dairying industry could never be built up in our South-West. Through the introduction of Subterranean Clover, and top-dressing with superphosphate—the advent of which two agencies have made a wonderful change in the outlook for the future—this feeling was dispelled. Consequently when we are again faced with a drop in values for our farm products, and when again it has become necessary to dispel a certain amount of depression, efforts must be renewed to show that our production can be still further increased. This does not mean an increase of acres cropped to produce a greater return for each head of stock, but an increased yield per acre to increase its stock carrying capacity, and thereby cut costs. This can be attained by the more general adoption by farmers of rotation cropping with field peas, thus ensuring the basic principle of agriculture, viz., the permanent fertility of our lands, and, as a natural corollary, financial stability.

We have read and know of lands in our Wheat Belt which became "wheat sick," and in the South-West "sheep sick" and "clover sick," with the resultant encroachment of the harsher and less nutritious grasses, such as Spear and Barley grasses in our clover pastures, calling for a system of farming that will remedy such defects. To achieve this a system of rotation with Field Peas as an annual essential crop is recommended. This recommendation is based upon personal success obtained during the past years when the only variety of Pea used was that known as the Brunswick White Field Pea. Of this type two varieties which I have called the "Large White" and the "Small White" have been grown by me.

The "Large White" is of a true white colour and large grain, and makes a very luxuriant growth with a small proportion of pods to the haulm. Blossoming and podding is, mostly, at the top of the plants, and takes place three weeks later than is the case with the "Small White." The yield is from 5 to 6 bags of grain to the acre. It is, however, more susceptible to grubs, and more expensive to harvest, owing to the larger proportion of haulm to pods. It is very suitable as a silage crop or ploughing in for humus.

The "Small White" is not true to colour, and has a smaller grain, is harder, and more dwarf in growth, blossoming and podding for weeks. From bottom to top the plants are literally smothered with pods, where conditions are favourable. It is less susceptible to grubs, and yields 8 to 10 bags to the acre. Owing to the bigger proportion of pods to haulm it is less expensive to harvest, and of the two varieties is the more suitable for our South-West conditions.

Obviously the most important question to farmers is "What is the crop worth?" This question is answered, from my own experience, under two headings —Firstly, the direct return obtained, meaning the quickest way in which the crop can be turned into cash; Secondly, the indirect returns to be obtained by feeding the crop to dairy cows, pigs and sheep by the benefit available to succeeding crops and the advantage of this rotation crop in the general routine of mixed farming.

1. *Direct Returns.*—Taking last season's crop as a typical example, an area of 30 acres was planted. Seed 2 bushels per acre. Superphosphate 1½ cwt. per acre. Yield 220 bags. Price realised 27s. per bag. Total £297.

Expenses of cultivating, planting and harvesting £3 per acre. Total (including seed and manure)—£90.

Net profit £207.

Sheep fattened on seed left on ground after harvesting—120. Net profit 5s. per head. Total £30.

Total net profit £237.

Based on the ruling price for peas in past years a net return of £6 to £7 per acre should be obtained. Expenses are heavier under the system of harvesting by raking, carting and threshing with horse and roller, as compared with the more modern method of the harvester with pea harvesting attachment. The capital outlay for the modern machine is too much for the small grower. A saving in bags can be effected by the use of washed superphosphate bags for the grain.

2. *Indirect Returns.*—Feeding the whole crop to sheep. A fair crop should fatten 15 to 20 sheep per acre. If crossbred wethers or lambs are bought right these should return £5 to £6 per acre. Feeding off the whole crop of peas is not favoured, as, if heavy rains should fall, with 15 to 20 sheep to the acre, many peas would be trodden into the ground, some of which would germinate and develop mouldy conditions, causing a loss of sheep, but, as hurdling and division fences are an expense, the whole crop may have to be fed off as one unit, and in such a case it is advisable to rake into windrows. The sheep will pick up the peas between rows and nose them out of the windrows, which, if wet with rain, would soon dry out again. The rake could be again used to turn them, if necessary.

Dairy Cows.—In my experience cows never milked better or gave more cream than when ground peas were added to the ration. Ground peas are a concentrate next to linseed in value.

	Peas.		Linseed.
Protein	19·4	...	19·4
Fat	1·0	...	34·7
Carbohydrates	49·9	...	18·0
Food units	101·0	...	155·2

My experience has been that peas can be stored as they are not attacked by mice or weevils.

Peas are one of the best concentrates in a ration for the putting on of solid meat. Butchers say that stock fattened on peas weigh out best. Peas can be fed whole or ground, mixed with the swill.

An important series of feeding and milling tests with pigs at Roseworthy College, South Australia, proved a ration including a mixture of barley, peas and wheat to be the most economical of those added to the basal ration of pollard and skim milk.

Increased values to succeeding crops.—Any succeeding crop does benefit from the nitrogen fixing habit of the legumes, and this is shown by their deep green colour. Oats for hay after peas stands feeding off two or three times, and then after shutting up for harvest cut 30 to 40 cwt. per acre; in some cases an additional yield of 1 ton per acre. The extra ton per acre this season meant all the difference between profit and loss on the ruling price of chaff.

The ground is most friable after peas and there is no need to wait for rains before ploughing with the disc and planting the succeeding crops.

Rotations.—It is possible (and has been done under our South-West conditions of heavy rainfall) to obtain three crops off the same ground in 12 to 14

months, where pea growing is included in the rotation. Thus, October to March—Maize and Sorghum; April to June—Burt's Early Oats or Barley; July to November—Peas. It is believed that such rotation will not exhaust the fertility of the land as two of the crops are fed off on the farm, as is a proportion of the peas.

Rotation 2.—Pasture after top-dressing with 1 cwt. superphosphate per acre in March. Grazed until the end of June and then planted with field peas. Peas growing from July to end of November, then harvested and fed to sheep, with grain on ground from January to April. Ploughed and drilled with oats and Subterranean Clover for feeding off, and later cut for hay in December. Summarised this rotation is—Peas, Oats and Subterranean Clover pasture.

Their advantage in general routine of mixed farming.—A paddock of peas, when raked safe from fire and used as a standby for sheep, can be threshed when convenient and is safe in windrows.

It permits the dairyman to fatten sheep as a profitable side line, without affecting the cow pastures; also, to turn over money on the three months' bill for sheep, which are sold when the first rains appear, and natural pastures for cows make growth.

SUMMARY.

1. A systematic rotation adhered to will increase production;
2. Make field peas one of the crops in the rotation;
3. Sow not less than 2 bushels per acre and 1½ cwt. of superphosphate on well drained land. A light loam is ideal;
4. Harvest portion of crop; feed to sheep what is left;
5. Put in oats and clover for cows;
6. Feed off and shut up for hay.

In conclusion let me say that the Legume family, to which peas belong, fix nitrogen from the air. There is thus an inexhaustible supply of what in wartime is the base of the most deadly explosives, but in peace, the base of all foods. As the old prophet Micah foretold of that age when "they shall beat their swords into plough shares," so may we look to that day in these times when scientific research on the potent element nitrogen will not be for the purpose of destroying life, but, by agricultural research, for the more and abundant production of plant life, so that "the desert shall blossom as the rose" and the dawn of that great day of "Peace on earth and goodwill towards men."

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CHEAP FACE-CUT SILOS AS USED IN THE MANJIMUP-JARDEE DISTRICT.

M. CULLITY,
Agricultural Adviser.

With the continued progress in the dairying industry and the considerable decline in many phases of farming from which farmers formerly derived portions of their income, more attention is being given generally to the getting of the maximum profitable production from dairy stock. To do this one of the matters receiving attention is production during our dry season, during which time there is a considerable decline in milk and cream production.

This sudden drop in production is a serious one for the farmer whose cows calve late, for those also who make a practice of calving down in spring. Those who arrange the freshening of their cows for the months April-June do not suffer to near the same extent; in fact they nearly escape its effect altogether, as this slump period would more or less coincide with the drying off of their stock.

For those, however, who wish to carry their cows in milk through this period, it is necessary to provide a succulent feed. This may be done in three different ways:—

1. By providing an area of permanent pasture as could be obtained on suitable locations with a mixture of some of the following:—

   Paspalum dilatatum,
   Paspalum distichum,
   White Dutch clover,
   Strawberry clover,
   Lotus major.

2. By growing fodder crops for feeding in the green state, crops such as maize, lucerne, sorghum, Sudan grass, etc., being suitable for this purpose.

3. By providing silage.

In all cases, of course, it is imperative to provide a sufficiency of good water.

It is the intention in these notes to describe one method of making silage, which has been practised with success in the Jardee district near Manjimup. This is by the conservation of fodder in a face-cut silo, the name face-cut being the trade name for certain pieces of timber which are rejected as unfit for ordinary sale. They are obtained in the turning of logs in milling, in which process the log is cut back until all defective timber is cut out. The planks are very suitable for the purpose to be described, the only defect in many being an occasional gum streak which prevented its use commercially.

In the district mentioned above, farmers are fortunate in having timber mills situated not many miles from their holdings, and so are in a position to cart any material purchased, thus saving a sum that in their circumstances is considerable.

The silo as erected is square, having usually 8 to 10 feet sides. The construction is very simple, and may be seen in a glance at the accompanying photographs. Four corner posts are erected, round bush poles being just as suitable

as sawn timber. Cross bearers are inserted on the inside of the posts in a horizontal position. The face-cuts are then fastened vertically to the inside of these, and arranged so as to have as smooth a surface as possible inside.

The cost of the silo is very small; an idea of it may be obtained from the following figures given by Mr. W. Kjellgren, of Middlesex, Jardee. His silo is 8 feet square and in all is 17 feet in height, but, as it has been erected in an old pit 6 feet deep, it stands only 11 feet above ground. The materials for this were as follow, Mr. Kjellgren making no allowance for his own labour, being concerned only with the actual amount of cash having to be paid out:—

	£	s.	d.
32 face-cuts 17ft. x 1ft. x 1in., at 1s. each	1	12	0
9 feet 4in. x 2in.	0	12	0
Nails, 4 to each board on each batten	0	6	0
	£2	10	0

Labour charges were not made, as Mr. Kjellgren contended that the whole was erected during slack periods, and periods of broken time when no other useful work could have been attempted.

Another farmer using this same type of silo is Mr. W. Cox, of Jardee. In this case the dimensions were 9ft. x 9ft. x 18ft., the bottom of the silo being 4 feet below ground level. The face-cuts used were wider than those obtained by Mr. Kjellgren, being up to 18 inches in width, and the consequence is that more warping has taken place. Mr. Cox intends to either replace these warped boards with narrower ones, or split them, giving a better hold on to the bearers, minimising the tendency to warp.

The cost of this silo without labour charges was £4, including bearers, face-cuts, nails, and cartage from the Jardee mill, approximately six miles.

This past season Mr. Cox ensiled six acres of crop, comprised of four acres of light oats and subterranean clover, being the first crop on this paddock, and two acres of good subterranean clover. The result was excellent. No estimate of the amount of waste was made, as a considerable amount of good silage was not used, owing to the method adopted for unloading the silo. An axe was used to chop out the silage, with the result that nearly as much good silage as there was waste was discarded. A better method would have been to take off the silage required in layers, throwing the rotten and mouldy material on one side.

An illustration of this silo is shown below.

Mr. G. F. Combs, of Jardee, is another who has been particularly successful in using this type of silo. This silo was estimated by Mr. Combs to have cost £7, including the charge for labour used in its construction. This one differs from those previously described in that it is wholly above ground and that, in general, narrower boards have been used, mainly flooring board size.

Mr. Combs also has a cement brick silo with cutter and blower. Last year time did not allow him to fill the concrete one, but the previous year both silos were used, and I had an opportunity of comparing the results. Of course, the cutter and blower were used in filling both. The results were amazing. The loss in the expensive structure was estimated at 5 per cent., while in the other face-cut silo the loss was only 2 per cent. greater, or a total of 7 per cent.

The following farmers also use this type of silo:—

J. Crawley, Jardee.
H. Grumpelt, Deeside Road.
E. W. Abbott, Jardee.
S. E. Beasland, Jardee.
G. Dodson, Jardee.

Mr. Grumpelt was probably the first to use this system, and has now had silage for the last seven years. He is entirely satisfied with his results.

Illustration I.—Facecut Silo erected by Mr. W. Cox, Jardee.

This silo, 10 feet long, 8 feet wide, and 16 feet high, takes usually from seven to 10 days to fill. The silage has always been cut the first week in November and has averaged five tons to the acre. With reference to its value in feeding to milch cows, Mr. Grumpelt says it maintains the milk flow and keeps his cows in a healthy condition.

Mr. Crawley has used the method for the past five years, with very similar results to those obtained by Mr. Grumpelt.

In the 1928-9 season a comparison was made by the writer of the measured loss in these silos as against the measured loss in open stacks. There were some

very bad attempts at making silage by both methods, but the worst failure with the face-cut silo could not be compared with the loss made in several stacks. Much of the loss was caused by lack of knowledge of the process of ensilage, crops being cut too late, left too long before carting in, and bad stacking and trampling being responsible in many cases for building up the waste beyond a reasonable figure.

The summary of the comparison above referred to showed that the average loss in the face-cuts was one-half only of the loss in the stacks. One or two stacks inspected were complete failures, while the worst fact-cut was better than the best stack. I am referring here still to the amount of loss, not wishing to make any comparison between the quality of the silage made by the two processes.

The disadvantages most frequently quoted against this system is that of difficulties in filling and emptying. This seems really great, but only then when compared with the stack, and even then the disability appears greater than is actually the case. In the stack the material is forked direct from the cart or sledge on to the top of the stack, while, in the other type, the filling takes place either over the top of the structure or else through the doors which are left in the better type. A whip-stick arrangement is used by Mr. Grumpelt for filling, while Mr. Crawley has a special loading fork and derrick. The unloading problem where doors are left at convenient heights is no different from that of a stack.

A few points that assist in reducing waste by this method are enumerated below:—

1. When wide face-cuts are used, they should be secured to the battens their whole width, otherwise warping will occur which will allow more air to reach the curing silage. Where green boards only can be obtained, it is much preferable to use narrow boards, as the tendency to warp is minimised.

2. The vertical boards should be as close together as possible so as to exclude air.

3. Where possible it is advisable to have the bottom of the structure below ground, as air is completely excluded in this portion. Four or five feet below ground level is not inconvenient.

4. Some of the waste in the square corners may be eliminated by placing in the angle about the position of the cross bearers a small batten, to which face-cuts may be nailed on the inside, so doing away with the right-angle corner as shown.

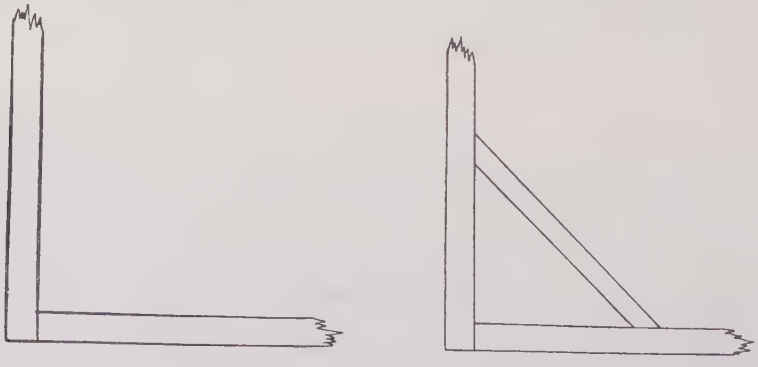

Illustration II

The following applies to stack, pit, and other methods of ensiling:—

5. The crop should be cut early. Where ordinary pastures are concerned, cutting may take place late in September or early in October. Less waste will result from silage made at this season than would be the case with later cutting. Cutting earlier than this would result in a too sappy or mushy silage with a considerable loss in feeding value.

The farmer in any case must arrange his work so that his ensilage season is finished before his paddocks are ready to cut for hay. Once the time for hay-cutting arrives, the farmer's energies are more profitably devoted to making hay.

6. Only as much material should be cut in one day as can be carted in and placed in the silo on that day. The usual method on most small farms is to cut in the morning and cart in during the afternoon.

7. The material first cut should be first carted.

8. In loading the silo, the material should be spread evenly and well trampled, paying most attention to the sides and corners. When leaving at night have some handy weights close by for laying on top. A few planks and sand-bags serve the purpose; when full cease cutting for a while till subsidence takes place. A convenient method of deciding when to recommence loading is to wait till the heat generated in the material can be felt in the top layer. This applies more particularly to where the material can be carted in fast. This filling and waiting to sink has to be continued for some time. Of course, the more carefully this is done, the more material ensiled and the better the resulting material will be.

With reference to the feeding value of the silage so made as compared with that from other systems of making silage, little information can be given. From analyses made early in 1929, it would appear that little difference exists between the various methods.

The table given below shows the analyses of silage made by various methods and approximately at the same time. Unfortunately no data is available regarding the crops ensiled. Subterranean clover was the basis of all the mixtures, but the variation in the amount of grasses and weeds present was not noted.

——	Type.	Per-centage Water.	Ash.	Nitro-free extract.	Sulphuric Ether extract.	Album-inoids.	Fibre.	Unit Value. Guthrie.
G. F. Combs	Concrete	68·6	3·53	13·3	1·45	4·01	9·11	20·57
	Face-cut	65·7	3·42	13·36	1·87	5·43	10·21	23·00
* 6	Stacks ...	70·9	3·09	12·22	0·84	4·05	8·90	18·16

* Stack Silage. Leaflet No. 295, by G. K. Baron-Hay, Department of Agriculture, Western Australia.

In conclusion, the following remark by Mr. W. Cox as the value of silage is of interest:—

> "I found that the flow of milk was greater, but the remarkable thing was the healthy condition of my stock, all my cows retaining their sleek appearance throughout the summer months."

KAPOK.

The Government Botanist, Mr. C. A. Gardner, is in receipt of a communication from a Fremantle resident who seeks information regarding kapok, and suggests that as a matter of general interest the reply be made through the *Journal of Agriculture*. In response Mr. Gardner has supplied the following information.

Kapok comes from the tree *Bombax malabaricum*, found in tropical Asia and northern Australia and seeds could be obtained in Perth. It would not, however, grow here, since it is purely a tropical one and unsuited to cold conditions, growing in rich soils which are well drained. (Basaltic soil in the Kimberleys.) There is a class of kapok made from cotton, which is cheaper than the true kapok.

A shrub growing at Chidlows, and described by the correspondent, is evidently the so-called "Duck Plant" or Cotton Bush (*Asclepias fruticosa*), which is altogether different in type from the true one, the silky substance contained in the pods having no staple and easily breaking up. It is doubtful if this would be of any value even for stuffing, and its growth should not be encouraged, as it is apt to become a weed, while the silky substance of the seeds has no economic value.

NAREMBEEN AGRICULTURAL BUREAU.

100-Acre Fallow Competition, 1930.

Judge: R. P. ROBERTS, B.Sc.(Agric.), Agricultural Adviser.

There were 21 entries received for this fallow competition, the first of its kind conducted by the Narembeen Agricultural Bureau, and of which judging took place from the 10th-14th February according to the following scale of points:—

Moisture	40
Mulch	10
Freedom from weeds	10
Consolidation of seed bed	20
Uniformity of preparation	20
	100

The rainfalls recorded at various stations in the district are set out hereunder:—

Station.	1929.								1930.
	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Jan.
Narembeen ...	220	365	203	108	31	35	216	...	...
Wadderin ...	339	363	257	134	25	37	282	4	...
Emu Hill ...	273	384	242	102	36	35	181	...	...
South Kumminin	247	377	225	121	30	33	260	...	...

The past season was not an ideal one for the preparation of good fallow. Excessive winter rains caused some of the heavier land to become too wet for the initial operation (ploughing), whilst the rapid drying-out in the spring did not allow sufficient time to work the land when in the desired condition for uniform work. The heavy falls at the beginning of November came at a time when farmers found it difficult to delay important work in hand in order to give attention to the fallow.

Despite these handicaps, however, some excellent fallows were submitted for inspection. The awards made are set out in the following table:—

NAREMBEEN AGRICULTURAL BUREAU.

100-acre Fallow Competition.

Competitor.	Address.	Moisture 40 pts.	Mulch. 10 pts.	Freedom from Weeds. 10 points.	Consolidation of Seed Bed. 20 points.	Evenness of Preparation. 20 points.	Total. 100 pts.
Mortimore, R. ...	Wadderin ...	35	9	9	18	19	90
Burgin and Yeoman	Wadderin ...	34	8	9	18	19	88
Dayman, G. S. ...	Emu Hill ...	33	8	9	18	18	86
Smith Bros. ...	C. Kumminin	33	8	9	18	17	85
Tucker, C. H. ...	S. Kumminin	36	7	9	14	18	84
Ruse, E.	Narembeen ...	34	7	9	18	16	84
Howell, A. ...	Mt. Arrowsmith	33	8	9	17	16	83
Hebberman, H. ...	Emu Hill ...	32	7	8	18	18	83
Berry, A. ...	Wadderin ...	33	8	7	16	18	82
Fricker, W. H. ...	Narembeen ...	28	9	9	17	18	81
Gibbings, T. E. ...	Mt. Arrowsmith	29	8	9	16	18	80
Cheetham, R. (No. 1 Entry)	S. Kumminin...	29	7	9	16	18	79
Price, J. H. ...	Narembeen ...	27	7	9	16	17	76
Cavanagh, F. O....	Hedges Siding	27	8	8	15	18	76
Savage, T. P. ...	Narembeen ...	26	8	8	16	17	75
Smith, N. ...	Emu Hill ...	29	7	9	15	15	75
Hewett, R. F. ...	Wadderin ...	32	6	8	14	15	75
Draper, A. T. ...	Narembeen ...	28	7	7	15	16	73
Cheetham, R. (No. 2 Entry)	S. Kumminin	27	6	7	16	16	72
Northmore, C. ...	Narembeen ...	25	6	9	13	17	70
Yandle, F. ...	S. Kumminin...	28	4	8	12	16	68

First place was gained by Mr. H. Mortimore, whose competing area was ploughed in July to a depth of 3½in.-4in. with a mouldboard plough. This entry was portion of 170 acres in the same paddock, the whole of which had been treated in uniform manner.

The land, which originally carried Salmon Gum, Gimlet, Tea-tree, and a little Morrell, was ploughed during the period end of June to middle of July. It was scarified with a rigid tyne cultivator the second week in September. After the rains in November, half was cultivated with a rigid tyne cultivator and half with a springtyne implement. As no rain had fallen subsequent to this latter cultivation the mulch was in an excellent condition, being loose, dry, and well corrugated. Weeds were almost totally absent, and the moisture content was good. The generally even and uniform appearance of this entry is worthy of comment.

Messrs. Burgin and Yeoman gained second place with an entry which was rigid-tyne scarified in June to a depth of 4 inches. It received further cultivations with the same implement in September and November. This piece of fallow was also almost entirely free from weeds and had a good level seed bed. The moisture content was good, but the mulch was, if anything, a little too deep.

The cultural methods employed by the competitors are set out in the following table:—

NAREMBEEN AGRICULTURAL BUREAU.

100-ACRE FALLOW COMPETITION.

Competitor.	Address.	Original Timber.	Time of Fallowing.	Type of Plough.	Depth of Ploughing.	Condition of Land at time of Ploughing.	Cultivations.	Sheep.
					inches.			
Mortimore, R. ...	Wadderin ...	Salmon gum, gimlet, tea-tree and morrell	July ...	Mouldboard ...	3½ to 4	Good ...	Springtyne cultivated in September. Part springtyne cultivated and remainder scarified after rain in November	Yes
Burgin and Yeoman	do. ...	Salmon gum and gimlet	June ...	Scarifier ...	4	Good ...	Scarified in August and again in November	Yes
Dayman, G. S. ...	Emu Hill ...	Salmon gum, gimlet and a little tea-tree	June-July	Rigid tyne cultivator	3	Good ...	Cultivated with a rigid tyne implement at the beginning of August. Springtyne cultivated in September	Yes
Tucker, C. H. ...	South Kumminin	Gimlet with some mallee and tea-tree	June July	Disc ...	3 to 3½	Wet ...	Ploughed again in August	No
Smith Bros. ...	Central Kumminin	Salmon gum and gimlet	June–July	Mouldboard ...	4	Good ...	Harrowed in June and again at the end of July. Part scarified and harrowed, and remainder springtyne cultivated first week in August. Part harrowed at beginning of February	Yes
Muse, E.	Narembeen ...	Gimlet, mallee and tea-tree	June July	Disc (Sundercut)	3 to 3½	Good ...	Scarified at end of July and again in middle of August. Part scarified again in November after rain	Yes
Howell, A.	Mt. Arrowsmith	Salmon gum and gimlet	June ...	Mouldboard ...	4	Good ...	Springtyne cultivated in September. Scarified in October	Yes
Hebberman, H. ...	Emu Hill ...	Salmon gum and gimlet	End of June	Mouldboard ...	2½	Good ...	Cultivated with a disc implement (Sundercut) in July. Springtyne cultivated in August. Half-springtyne cultivated and remainder harrowed after rains in November	Yes
Berry, A.	Wadderin ...	... ...	...	... ...	...	...		
Fricker, W. H. ...	Narembeen ...	Mainly gimlet ...	June ...	Mouldboard ...	4	Good ...	Cultivated with a springtyne implement the first week in August, the second week in September and the last week in November	Yes

NAREMBEEN AGRICULTURAL BUREAU—*continued.*

100-Acre Fallow Competition—*continued.*

Competitor.	Address.	Original Timber.	Time of Fallowing.	Type of Plough.	Depth of Ploughing.	Condition of Land at time of Ploughing.	Cultivations.	Sheep.
					inches.			
Gibbings, T. E. ...	Mt. Arrowsmith	Salmon gum, jam, mallee and white gum	July ...	Mouldboard and disc (Sundercut)	4	Wet ...	Springtyne cultivated in September and again after rains in November	Yes
Cheetham, R. (No. 1)	South Kumminin	Gimlet, salmon gum and mallee	End of June	Mouldboard ...	3	Rather wet	Cultivated with a disc implement at the end of August. Harrowed in September	Yes
Price, J. H. ...	Narembeen ...	Salmon gum, gimlet and mallee	June–July	Mouldboard ...	3	Fair ...	Cultivated with a disc implement in August. Harrowed in September. Springtyne cultivated after rain in November	Yes
Cavanagh, F. O. ...	Hedges' Siding...	Salmon gum and gimlet	July ...	Mouldboard ...	4	Fair ...	Cultivated with a disc implement in July. Springtyne cultivated in September	No
Savage, T. P. ...	Narembeen ...	Gimlet and morrell ...	July–August	Mouldboard ...	3½ to 4	Rather dry	Springtyne cultivated in November. Half springtyne cultivated at the end of January	Yes
Smith, N	Emu Hill ...	Gimlet, Yorkgum, and mallee	June ...	Mouldboard ...	4	Good ...	Cultivated with a disc implement (Sundercut) in July. Cultivated in August with a Springtyne implement and again in November after rain. Harrowed immediately after the latter cultivation	Yes
Hewitt, R. F. ...	Waddering ...	Gimlet, tea-tree and salmon gum	July ...	Disc (Sundercut)	3	Very wet...	Harrowed 1rst week in August. Cultivated with a disc implement (Sundercut) at the end of August	No
Draper, A. T. ...	Narembeen ...	York gum and jam ...	July ...	Disc (Sundercut)	4	Fair ...	Cultivated with a disc implement (Sundercut) in September	No
Cheetham, R (No. 2)	South Kumminin	Gimlet, salmon gum and mallee	June ...	Mouldboard ...	3	Good ...	Cultivated with a Springtyne implement at the end of July and again in September	Yes
Northmore, C. ...	Narembeen ...	Salmon gum and gimlet	June ...	Rigid tyne cultivator	3	Good ...	Crossed with rigid tyne cultivator in July. Cultivated with a disc implement (Sundercut) and springtyne cultivated in October	Yes
Yandle, F.	South Kumminin	Gimlet, salmon gum and mallee	August ...	Mouldboard ...	4	Wet ...	Half harrowed and springtyne cultivated in September. Remainder springtyne cultivated after rain in November	Yes

A study of the above cultural details reveals several points of interest.

It will be noted that over 75 per cent. of the competitors had sheep depastured on their fallow during the year. This, in conjunction with the dry summer, resulted in most of the competition plots being almost completely free of weed growth. Practically the only weed noticed was "Potato Weed" (*Solanum hoplopetalum*), which, owing to its prickly nature, is not eaten by the sheep. In addition to controlling weeds, sheep are of great value on account of their tramping over the fallow, assisting to compact the seed bed.

The type of plough most favoured was the mouldboard. Different types of ploughs have their own slight advantages and disadvantages on different classes of soil. However, the type of implement used is not of great importance as long as the work is done thoroughly and evenly.

On the lighter soils good work can be done with the rigid tyne cultivator or scarifier, provided the land surface be clean and free of weeds.

Experiments have shown that there is no advantage gained by ploughing deeper than four inches. On the other hand, it is doubtful whether uniform and effective work can be done when attempting to plough at depths much less than this.

Fallowing should be completed as early as possible during the winter months. Experiments over a number of years have shown that August fallow is definitely inferior to that fallowed in June.

For subsequent treatment of the fallow there seemed some considerable difference of opinion concerning the most suitable implements to use. It is not possible to lay down hard and fast rules, as so much depends upon the vagaries of the season and the class of soil being dealt with. However, an attempt has been made below to give an outline of the general principles which have been found most suitable for application in the Western Australian wheat areas.

It has been definitely established by experiments carried out at the Merredin Experiment Farm that it is more profitable to fallow early during the winter months. The results of the experiments referred to show that over a number of years June fallowing is approximately 25 per cent. better than August fallowing. For this operation the type of plough to use is not material. The implement used depends on the nature and condition of the land to be worked, but whatever implement is selected, it is important that the work be done thoroughly. It is generally found that more thorough work can be relied upon when the mouldboard is used.

Before and after the ploughing operations, the land should be fed bare with sheep. This permits of the implement doing better work, and reduces the number of subsequent cultivations required to control weed growth.

The number of cultivations given to the fallowed area will depend upon weed growth and rainfall. The object in view is to destroy weed growth and maintain an even mulch of about 2in. deep, not too fine, but well corrugated.

Another experiment carried out at the Merredin Experiment Farm for the past 14 years shows that numerous cultivations during the summer are not advantageous, except to destroy weeds, and after heavy rains which cause the mulch to become hard and set. The results of the experiment, however, show that it is advantageous to cultivate in the spring and before planting.

Under normal conditions the springtyne cultivator is suitable for these cultivations. For the first operation, usually at the latter end of August and during September, the cultivation should be to the full depth of the ploughing. The object of this deep cultivation is to bring to the surface clods which had been ploughed under and which otherwise would have hindered the consolidation and tended to the formation of air pockets. The vibration and combing effect of the springtyne cultivator make this machine ideal for this work; the finer particles are sifted down to fill the spaces originally occupied by the larger lumps, thus assisting in the formation of an even and compact seed bed.

Subsequent cultivations should be carried out only when required after heavy rains to kill weeds and maintain the mulch. The depths of such cultivations should be about two inches, but should weeds be present the depth may need to be increased to destroy them. For larger weeds, and when the ground has become hard and set, the springtyne implement is not always suitable. Under such conditions a heavier implement is necessary. The disc cultivating type of plough and the rigid tyne cultivator are suitable. The objection to the former is that it has a tendency to bury the larger clods bringing the finer soil to the surface. Thus the mulch becomes too flat when it more readily becomes hard and set after further rain.

After lighter falls of rain during the summer, when weed seeds germinate, the harrows are useful to destroy the young seedlings, but they are of little use for the larger weeds. They tend to make the mulch too fine and flat, and if not attended to with a tyned cultivator immediately after heavy rain, difficulty will be experienced in securing the desired uniform tilth at seeding time.

When a combined cultivator seed drill is not used the land requires to be cultivated prior to seeding, preferably with a springtyne implement to a depth of about two inches.

At seeding time the fallow should be free of weeds with the mulch two inches deep, uniform and not too fine, but the surface will be corrugated. The presence of surface clods the size of one's fist and smaller is ideal. The subsurface soil should be moist, compact and firm, but not hard.

FIFTY ACRE FALLOW COMPETITION, 1929-30.

BRUCE ROCK AGRICULTURAL SOCIETY.

Judge—G. E. THROSSELL, Agricultural Adviser.

Eight farmers submitted their fallows for this competition, and although this number was two less than the previous year, as the table of points indicates, the standard maintained in the competition was high. Two new competitors participated this year, the others being consistently ardent supporters of fallow competitions. It is rather surprising that more farmers in the Bruce Rock district do not enter.

The same scale of points as adopted in previous competitions was used this year.

The following table shows the rainfall recorded from June to the end of February, during which month the judging was done:—

	Fallowing rains.				Spring rains.			Summer rains.					Total rain on fallow.
	June.	July.	Aug.	Total.	Sep.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Bruce Rock ...	312	216	120	648	21	41	62	233	3	...	...	236	946
Babakin ...	355	180	82	617	26	57	83	211	2	...	3	216	916
Central Kumminin Bungulluping	335	184	110	629	28	31	59	164	...	...	...	164	852

Good rains fell during the fallowing period, June being a particularly wet month. The spring rains were practically negligible, and on account of harvesting operations the heavy rains early in November could not be utilised to full advantage.

The awards are set out in the table hereunder:—

BRUCE ROCK AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1929–30.

Awards.

Competitor.	District.	Points.					
		Moisture.	Mulch.	Absence of Weeds.	Consolidation.	Uniformity of Preparation.	Total.
		40 pts.	10 pts.	10 pts.	20 pts.	20 pts.	100 pts.
C. E. and N. S. Schilling	Bungulluping	36	9	9	19	19	92
Buller & Black ...	Babakin ...	36	8	9	19	19	91
F. C. Farrall & Sons	Yarding ...	36	8	9	19	18	90
Smith Bros. ...	Central Kumminin	36	8	9	19	18	90
P. A. Strange ...	Eujinyn ...	37	8	8	18	19	90
S. A. Brown ...	Bungulluping	35	8	8	19	19	89
Leah & Sons ...	Yarding ...	36	8	8	19	18	89
F. C. Farrall & Son	Yarding ...	35	8	9	19	18	89

The winners this year were the partners E. S. and N. S. Schilling, of Bungulluping, whose fallow scored 92 points. Only one point separated the runners up, Messrs. Buller and Black, of Babakin, whose keen spirit of healthy rivalry, year after year, deserves mention. That only three points should separate the first and last competitors shows the standard reached was a high one. It is noticed also when travelling about the district that a general improvement in the quality of the fallow can be seen.

An analysis of the cultural details of competitors has been prepared in the following table:—

Competitor.	Original Timber.	Years Cropped.	Rotation. Years.	When Ploughed.	Type of Plough.	Depth of Plough-ing.	Cultivation.	Sheep.	Points Awarded.
1—C. E. & N.S. Schilling	Salmon Gum and Gimlet	?	3	June	Sundercut ...	3–4	Cultivated with a Sundercut July and August, with a combine drill in November	Yes	92
2—Buller & Black ...	Jam and York Gum	?	3	June–July ...	Sundercut ...	3	Harrowed July, scarified August and October	Yes	91
3—F. A. Farrall & Sons	Salmon Gum and Gimlet, Jam	5	3	Mid May ...	Mouldboard...	4	Reploughed with sundercut early August. Cultivated with a combine drill end August and with springtyne early November. Harrowed end November	Yes	90
4—Smith Bros ...	Salmon Gum and Gimlet	...	...	June	Mouldboard...	3	Harrowed June, scarified twice in August. Portion in November, balance with a springtyne	?	90
5—P. A. Strange ...	Jam, York Gum and Wattle	7	3	July-August ...	Mouldboard ...	3–4	Cultivated with a springtyne in September	Yes	90
6—S. A. Brown ...	Salmon Gum and Gimlet	9	3	July	Scarifier ...	3	Turned back with sundercut in September. Scarified in November	Yes	89
7—Leah & Son ...	Salmon Gum, Gimlet and Morrell	7	3	June	Mouldboard...	3	Cultivated with a combine drill in July, August and October	Yes	89
8—F. C. Farrall & Sons	Salmon Gum and Gimlet	8	2	June	Mouldboard...	4	Springtyne cultivated in June, sundercut in August, scarified September, harrowed November	Yes	89

As mentioned previously, it was difficult to work the fallow after the early November rains on account of the harvest. After such heavy rains it is necessary to restore the tilth of the mulch, which should be at least two inches deep to be effective. Where harrows had been used the mulch was too fine and level, and on the shallow side.

The competing areas were very free of weeds this year, weather conditions during the spring being ideal for weed destruction, and now that sheep are more in evidence clean fallow should result.

When a cultivation with a disc implement has been found necessary, it is advisable to use for the next operation, a tyned implement. This leaves the mulch in a corrugated condition, and thus does not have such a tendency to "set" after a heavy fall of rain.

FIFTY ACRE FALLOW COMPETITION, 1929-30.

SOUTHERN MALLEE AGRICULTURAL SOCIETY.

Judge—G. L. THROSSELL, Agricultural Adviser.

For the first fallow competition conducted in the Esperance wheat area, by the Southern Mallee Agricultural Society, there were nine competitors. It was expected that a considerably larger number of farmers would have participated on account of the assistance which both the Agricultural Bank and the Department of Agriculture are giving to fallowing in this area.

Because of the variation in soil and climatic conditions in this area, the Agricultural Society decided to divide the competition into two sections, South and North. The Southern section was for those farmers located in the Esperance Road Board district, which receives a larger rainfall and where the clay soils predominate. The Northern section, defined by the Dundas Road Board area, has soils of a lighter nature and less rainfall.

The competition received better support from the South, Scaddan and Treslove supplying five of the six entries in this section, while in the North there were only three entries.

The points under which the competition was judged are as follows:—

Moisture	40	points.
Condition of Mulch	10	,,
Absence of Weeds, Suckers, etc. ..	10	,,
Consolidation of Seed Bed	20	,,
Uniformity of Working and Thoroughness of Preparation ..	20	,,
Total	100	,,

The following table shows an analysis of the rainfall from the commencement of fallowing to the time of judging, which was done early in March:—

Place.	Fallowing Rains.				Spring Rains.			Summer Rains.					Total on Fallow.
	June.	July.	Aug.	Total.	Sept.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Scaddan ...	293	143	87	523	47	55	103	283	116	2	...	401	1,026
Red Lake ...	244	139	193	576	13	63	76	212	60	...	...	272	924
Salmon Gums	201	135	133	469	21	43	64	184	33	2	...	219	742
Dowak ...	217	130	88	435	13	38	51	153	53	2	...	208	694

The fallowing rains were up to average and the ploughing season finished with a good general rain at the end of August. The spring rains were conspicuous by their absence, and the heavy falls during November and December could not be utilised to full advantage on account of harvesting operations.

The following table shows the points awarded:—

Competitor.	Nature of Soil.	Years Cropped.	When Fallowed.	Type of Plough.	Depth of Ploughing.	Cultivations.	Points Awarded.
					inches.		
Southern Area (Esperance Road Board Area)—							
1.—Grigg Bros	Clay land	4	July ...	Disc ...	3 to 4	Cross-ploughed September; springtyne cultivated January	90
2.—H. H. Gurney ...	Sandy clay, fluffy patches	1	June ...	Disc ...	3 to 4	Cross-ploughed September; harrowed November	88
3.—W. F. Webster ...	Loamy sand	2	June ...	Sundercut ...	3 to 4	Cross-sundercut in December	86
4.—A. E. Erdman ...	Clay loam	1	August ...	Disc ...	3 to 4	Cultivated with a springtyne cultivator in September and November	85
5.—J. Anderson ...	Clay land	4	July ...	Disc ...	4	Cultivated with a springtyne end of September; harrowed after rain December and January	83
6.—H. Ibbotson ...	Sandy loam	New land	September ...	Disc ...	4	Replonghed in December	78
Northern Area (Dundas Road Board Area)—							
1.—Nulsen & Dunn ...	Sandy loam	1	July ...	Disc ...	4	Cultivated with a springtyne cultivator in September	89
2.—H. Paul	Sandy loam	...	... ...	... ...	...	... ...	87
3.—H. Arthurell ...	Sandy loam	New land	June ...	Sundercut ...	4 to 6	Harrowed in October	83

The Southern section was won by Messrs. Grigg Bros., of Scaddan, with an entry which scored 90 points. This fallow was also awarded the Championship for the whole area. The Grigg Bros. were among the pioneers of the district, and their well merited success will do much to focus the attention of others to the value of good fallow which, from experience, Grigg Bros. have found so necessary. A Departmental Field Trial, in the form of a Time of Seeding Experiment, has been planted on portion of this fallow.

Messrs. Nulsen and Dunn, of Kumarl, won the Northern section, scoring 89 points, and were placed second in the Championship.

It is not intended in this report to review fully the subject of fallowing, but to point out a few details which are either not generally appreciated or not fully understood.

Making a thorough job of the initial operation of ploughing is half the battle in the preparation of a good fallow. Subsequent cultivations will not entirely remedy faulty ploughing, nor can they wholly overcome the defects and achieve the results obtained from a thorough ploughing.

There are some in this district who have the idea that after ploughing, the land should be harrowed to "level it off and break the clods." This is exactly the opposite to what is required. During the winter, the surface of the fallow should be left in a rough condition in order to prevent it from running together and setting, as well as to enable as much rain to penetrate into the soil as possible. Once the surface has set, the water runs off instead of soaking in. Moisture is also lost by evaporation. A very striking instance of this came under my notice recently. One settler, despite advice to the contrary, harrowed his fallow after ploughing and the land, being a heavy clay, set down "like a road." The consequences are obvious.

From the point of view of sucker control, there is no doubt about the value of a cross-ploughing, even when the first ploughing was done thoroughly. This is not only the experience of many farmers in the "mallee" but is also confirmed at the Salmon Gums Experiment Farm. In cultivating the "new-burn" fallow, portion was cross-ploughed in the spring and the balance worked with a springtyne cultivator. The Manager (Mr. L. G. Seinor) informs me that when the suckers were cut prior to seeding, an average day's work on the cross-ploughed section was between three to four times greater than on that which was springtyne culitvated. It is realised, of course, that cross-ploughing is a more expensive operation than a springtyne cultivation, but knowing the value of the former, farmers should strive to do this, where necessary, and it will pay in the long run.

Probably one of the worst defects in the fallows was that they were too flat, *i.e.*, the surface was too fine and level, and the mulch had a tendency to run together. The soils of the "mallee" do not remain cloddy and crumbly, as they do in other portions of the wheat belt, but have a marked tendency to "fine up." Therefore a springtyne cultivator or a scarifier should be used in preference to harrows. Harrows will kill weeds only in the very early stages of their growth. One competitor used these for weed destruction after rain in summer, but as the land was a heavy clay, this operation did more harm than good, and he had the greatest difficulty getting the land back into condition prior to seeding.

Fallow competitions can do a great deal towards improving the standard of fallow in a district. Therefore it is hoped that the farmers in this area will take a more active part in the competition this year. Those competitors who did participate in the competition under review are to be congratulated on their keenness which made the competition possible.

An aspect which should be borne in mind in the future is that competitors should not concentrate their efforts on a particular fifty acre piece and allow the standard of the balance of their fallow to suffer in consequence. This would defeat one of the primary objects of the competition, that of improving the general standard of the district's fallow, and would take away the commercial value as well, quite apart from holding the competitor up to ridicule.

FIFTY ACRE FALLOW COMPETITION, 1929-30.

MT. MARSHALL AGRICULTURAL SOCIETY.

Judge—G. L. THROSSELL, Agricultural Adviser.

There were fourteen competitors in the fallow competition conducted by the Mt. Marshall Agricultural Society this year, the competition being judged in February.

The rainfall from June to February is shown in the table hereunder:—

	Fallowing Rains.				Spring Rains.			Summer Rains.					Total Rain on Fallow.
	June.	July.	Aug.	Total.	Sept.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Bencubbin ...	182	86	100	368	16	25	41	131	2	...	21	154	563
Gabbin, North	216	110	106	432	22	76	98	78	...	...	...	78	608

The points awarded are shown in the following table:—

MT. MARSHALL AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1929-1930.

Judge—G. L. Throssell, Dip. Agric., Agricultural Adviser.

Competitor.	Address.	Moisture.	Mulch.	Absence of Weeds.	Consolidation.	Uniformity of Preparation.	Total.
		40 pts.	10 pts.	10 pts.	20 pts.	20 pts.	100 pts.
1.—Thompson, M. A.	N. Bencubbin	34	9	9	19	19	90
2.—Breakell & Son ...	Bencubbin ...	35	8	9	19	18	89
3.—Gobbart, W., & Son	Gabbin ...	35	8	8	19	18	88
4.—Brindle, R. ...	do. ...	34	8	9	18	19	88
5.—Collins, M. C. ...	Bencubbin ...	36	8	8	17	18	87
6.—Oaten, W. R. B.	Gabbin ...	34	8	8	18	19	87
7.—Clare, P. ...	do. ...	33	8	9	19	18	87
8.—Langley Bros. ...	N. Bencubbin	33	9	8	18	18	86
9.—McManus Bros. ...	do. ...	32	8	9	19	18	86
10.—Flitcroft, H. ...	Gabbin ...	33	8	8	18	17	84
11.—Lawrence, S. T....	do. ...	32	7	9	19	17	84
12.—Breakell, R. T. ...	N. Bencubbin	32	8	6	18	17	81
13.—Veal, S.	Gabbin	33	7	7	17	17	81
14.—Burn G. H. ...	do.	32	8	7	17	17	81

Mr. M. A. Thompson, of North Bencubbin, a new competitor, won the competition with an entry which scored 90 points. This fallow was ploughed in June with a disc implement to a depth of four inches, and was cultivated to the full depth of ploughing with a springtyne cultivator at the end of July and early August. The next cultivation was with the same implement after rain in November. This operation was not quite as deep, and produced a good seed bed under a mulch about 2½ inches deep.

H. Breakell & Son, also new competitors, were awarded 89 points for their entry.

The following table summarises the cultural details of competitors. Information was not available from two entries.

Competitor.	Original Timber.	Years Cropped.	Rotation.	When Fallowed.	Type of Plough.	Depth of Ploughing.	Cultivations.	Points Awarded
1.—M. A. Thompson	Salmon gum, gimlet and morrell	...	...	June ...	Disc ...	inches. 4	Springtyne cultivated July–August and early November	90
2.—H. Breakell & Son	Salmon gum, gimlet, morrell and tea-tree	Since 1912	3	July ...	Mouldboard	3 to 4	Skimmed with sundercut in August. Springtyne cultivated in November	89
3.—W. Gobbart & Son	Gimlet, mallee and tea-tree	Since 1923	2	June ...	Sundercut ...	4	Springtyne cultivated July, August, and November	86
4.—R. Brindle ...	Morrell, salmon gum, gimlet and tea-tree	4	3	June-July ...	Mouldboard	3½	Springtyne cultivated July, October, and January	87
5.—M. C. Collins ...	Salmon gum and gimlet	...	3	Early June	Mouldboard	4	Disc harrowed in September	87
6.—W. R. B. Oaten	Salmon gum, gimlet and tea-tree	Since 1922	2	End June ...	Sundercut ...	3 to 4	Crossed with sundercut in August. Harrowed in February	87
7.—P. Clare ...	Gimlet and mallee ...	Since 1916	2	July ...	Mouldboard...	3	Crossed with sundercut in September. Springtyne cultivated November	87
8.—Langley Bros. ...	Salmon gum, gimlet, mallee and tea-tree	4	2	July ...	Disc ...	3 to 4	Cultivated with combine drill in August	86
9.—H. Filtcroft ...	Salmon gum, gimlet and tea-tree	...	2	June ...	Disc ...	3 to 4	Crossed with sundercut early September. Springtyne cultivated October and portion November	84
10.—R. T. Breakell ...	Salmon gum and gimlet	Since 1910	2	July ...	Disc ...	4	Cross sundercut August. Springtyne cultivated September and November	81
11.—S. Veal	Salmon gum, gimlet and morrell	Since 1923	2	June ...	Disc ...	3	Springtyne cultivated August, September, and October	81
12.—H. G. Burn ...	Salmon gum, gimlet and morrell	Since 1914	2	July ...	Sundercut ...	3	Springtyne cultivated September. Portion in November	81

A rather interesting example of the advantages of a springtyne cultivator was observed when judging. Portion of one entry had been worked, after rain, with a heavy disc implement and another portion with a springtyne cultivator. It was found that the moisture content in the tyne cultivated portion was greater. The condition of the mulch was also better.

The weed commonly called Summer Thistle, Californian Thistle, or Potato Weed (*Solanum hoplopetalun*) is becoming too prevalent. A few of the competing areas were rather badly infested. It is quite erroneous that this weed is only unsightly and is not a robber of moisture. It is an undesirable weed to have growing on the farm, and can be checked with less difficulty by cultivation in the early stages of its growth. Sheep have been observed to eat the berries, but it is reported that this is a means of spreading the seeds all over the farm.

FIFTY ACRE FALLOW COMPETITION, 1929-30.

MERREDIN AGRICULTURAL SOCIETY.

Judge—G. L. THROSSELL, Agricultural Adviser.

Twelve entries were submitted for judging in the fallow competition this year, and although there was a falling off of eleven compared with the previous year, when twenty-three entries were received, it is pleasing to note that six competitors entered the competition for the first time, and in fact the first three places were filled by them. The newer districts are apparently alive to the value of a fallow competition, and they are better represented than the older settled areas.

The rainfall from June to February is shown in the following table:—

Place.	Fallowing Rains.				Spring Rains.			Summer Rains.					Total Rain on Fallow.
	June.	July.	Aug.	Total.	Sept.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Merredin ...	389	137	128	654	21	52	73	233	1	...	1	235	962
S. Walgoolan	242	109	86	437	14	39	53	428	5	...	...	433	923
Nukarni ...	270	103	77	450	15	64	79	205	...	...	...	205	734

Although good rains fell early in the fallowing period they were not maintained, and difficulty was experienced in finishing ploughing on account of the hardness of the ground. The first six fallows, however, were ploughed in June, which has proved to be the best month for fallowing. The spring was exceptionally dry, but heavy rains were recorded during the first week in November. Half of the competitors availed themselves of this opportunity to give the fallows a further cultivation.

The awards are set out in the following table:—

MERREDIN AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1929–1930.

AWARDS.

Competitor.	District.	Points.					
		Moisture.	Mulch.	Absence of Weeds.	Consolidation.	Uniformity of Preparation.	Total.
		40 pts.	10 pts.	10 pts.	20 points.	20 points.	100 pts.
J. B. Lambert ...	South Burracoppin	35	8	9	19	19	90
H. C. Emmett ...	North Merredin	35	9	8	19	18	89
King Bros. ...	Walgoolan ...	34	9	8	19	18	88
J. D. Maughan ...	do. ...	34	8	8	19	19	88
M. Murphy ...	do. ...	34	8	9	18	18	87
J. H. Smallacombe	Nangeenan ...	34	8	8	19	18	87
R. M. King ...	Walgoolan ...	32	9	8	19	19	87
T. J. & C. Maughan	Nukarni	33	8	7	18	19	85
Sheard & Shaw ...	North Burracoppin	33	8	7	18	19	85
W. H. Cockram ...	Nukarni	33	7	8	18	17	83
W. Cook	South Burracoppin	32	8	6	18	19	83
J. E. Clothier ...	Totadgin' ...	32	7	7	19	17	82

The competition, which was judged in February under a similar scale of points as in the previous year, was won by Mr. J. B. Lambert, of South Burracoppin, with an entry which scored 90 points. Mr. H. C. Emmett, of North Merredin, with a total of 89 points, was placed second. Both these competitors have not previously entered a fallow competition, and are to be congratulated on their success in their initial attempt.

The details of the cultural methods of the competitors are shown in the following table:—

Competitor.	Original Timber.	Years Cropped.	Rotation.	When Fallowed.	Type of Plough.	Depth of Ploughing.	Cultivations.	Points Awarded.
		years.	years.			inches.		
1.—J. B. Lambert	Salmon gum and gimlet	4	2	June	Scarifier	3	Sacrified in July and November; harrowed in November	90
2.—H. Emmett ...	do. do. ...	...	2	June	Sundercut ...	4 to 6	Turned back with sundercut August; harrowed in September and October; cultivated with springtyne in November	89
3.—King Bros. ...	do. do. ...	3	2	June	Sundercut ...	3 to 4	Scarified in September; cultivated with a springtyne in November	88
4.—J. D. Maughan	Gimlet and ti-tree ...	5	2	June	Disc ...	3 to 4	Scarified in July and August; springtyne cultivated twice in September, October, and harrowed in November	88
5.—M. Murphy ...	Gimlet and morrell ...	4	2	June	Disc ...	3 to 4	Scarified in July; springtyne cultivated in October	87
6.—J. H. Smallacombe	Salmon gum and gimlet	...	2	July–August	Mouldboard	4	Cross-ploughed with disc September; springtyne cultivated November	87
7.—R. M. King ...	do. do. ...	4	2	July	Disc ...	3 to 4	Reploughed in August; cultivated with combine drill November	87
8.—T. J. & C. Maughan	do. do. ...	(No details sent in — absent when judged)						
9.—Sheard & Shaw...	Gimlet	7	2	July	Scarifier ...	3 to 4	Scarified in September and November	85
10.—W. Cook ...	Salmon gum, gimlet and morrell	9	3	July	Disc ...	4	Cultivated with a sundercut in August and September	85
11.—J. E. Clothier ...	Salmon gum and gimlet	...	2	August	Portions with combine, mouldboard, and disc	3 to 4	Cultivated with combine drill in October and November	82

From this table it will be seen that at present almost all the competitors are employing a two-year rotation—fallow, wheat. This rotation

is a very exhaustive one on the soil, and in time will cause a variety of troubles, for instance depletion of the humus or organic matter, which results in deterioration of the physical condition and decline of fertility. But what is perhaps the most immediate result of a two-year rotation is the increase of such diseases as "Takeall" and Flagsmut. When fencing, water supplies, and reserves of feed have been obtained, farmers will be able to change to a three-year rotation—fallow, wheat, pasture.

The winning fallow was not ploughed, but scarified in June. This may seem to some to be a departure from the usual requirements of fallowing. However, it is not the type of implement which is so important, but that whatever implement is used, it is suited for the work and is doing the work thoroughly. In this case the scarifier was satisfactory, but it would not be advisable, on the result of this, to recommend a scarifier for fallowing on all classes of soil or for all soils of the same class as this.

Experiments at the Merredin Experiment Farm show that for Salmon Gum and Gimlet soils it is unnecessary to plough deeper than four inches, providing the work is done uniformly. However, ploughing deeper does not decrease the yields, if a proper seedbed has been prepared, but it requires more power, and hence four-inch ploughing is the most economical.

A REVIEW.

ELEMENTARY PRACTICAL AGRICULTURAL CHEMISTRY.

E. M. JOINER, B.Sc., Senior Science Master, Dookie Agricultural College, Victoria.

LON. W. PRUNSTER.

This small book is written for students of Agricultural Chemistry, and sets out a series of simple exercises in chemical manipulation. This is to enable the student to understand fully the underlying principles of analytical chemistry, provided he has had some previous training in elementary theoretical chemistry.

The book is particularly concise, and has a moderately wide range, due mainly to the manner in which it is written.

Beginning with a Qualitative Analysis section, it gives a well set out summary of Preliminary "Dry-Way" Tests and of "Wet-Way" Tests, with the inferences to be drawn from each, and a series of confirmatory tests for each of the metals and acid radicals following. This portion of the book is useful not only to the student, but to the past student, who is liable at any time to have to perform a little qualitative analysis. The section dealing with the volumetric analysis is much more concise, and, in consequence, is not likely to be as useful for after references as the previous section on Qualitative Analysis.

The experiments on substances of agricultural interest include experiments on water, milk, butter, soils, manures, and pickling materials, and are followed by notes on the properties of the simpler and more common organic compounds.

On the whole, the book is set out in note form, and is very easy to refer to for simple reactions and experiments. It gives a general and well set-out course for the teacher of elementary practical agricultural chemistry. This course has two good features, the first being that it can without difficulty be enlarged upon, and provides a good skeleton on which to build up a much more advanced course in Agricultural Chemistry, and the second, that it deals with subjects which are essentially Australian.

The book should prove to be of use in this State to both teachers and students, wherever agricultural chemistry is taught as a subject distinct from pure chemistry.

The book is published in Australia by Robertson & Mullens, Limited, of Melbourne, and may be obtained through the local booksellers; retail price, 6s.

MURESK AGRICULTURAL COLLEGE.

CHICKEN-FEEDING EXPERIMENT CARRIED OUT BY J. H. RICHES, B.Sc. (Agric.), AND S. FROOME.

Introduction.

The importance of supplying a ration adequate in regard to minerals as well as to what are usually regarded as food nutrients has become increasingly evident in recent years with the developments of high producing, early maturing breeds. This had led to investigations into the relative importance of the various mineral substances required, the amount occurring in the ordinary foodstuffs, and the best means of making up any deficiency.

Experiment has shown that an element which is very frequently deficient is phosphorus, and it is possible to make good this deficiency by the addition of calcium phosphate to the diet in the form of sterile bone meal.

Bone meal is always incorporated as a standard part of the mash fed to growing chickens, and it occurred to the authors to test whether this bone meal might not be replaceable by a mineral phosphate which would be cheaper and more easily obtainable.

Accordingly an experiment was planned to test this theory.

Method of Investigation.

Ground Nauru rock phosphate being the most readily obtainable mineral phosphate, it was decided to test it against the bone meal; later, on the suggestion of the Director of Agriculture, basic superphosphate was also included in the test.

The experiment was commenced as soon as the chickens were old enough to be removed from the brooder house to the chicken pens. The lots were made up of 18 chickens, 16 White Leghorn and two Black Orpington in each, no attempt being made to select for sex.

As it was impossible owing to the lack of facilities to put a distinguishing mark on each bird, it was decided to take the aggregate weight of each lot. These weights were to be taken at fortnightly intervals.

The chickens received the mash at the morning and mid-day feeds, and received whole wheat grain at night. They had a plentiful supply of fresh water, and were also supplied with shell grit *ad lib.*

The mash, which was similar to that fed to all the chickens on the farm, was made up by volumes, the amounts not being weighed exactly; as, however, the density of the ingredients did not vary to any great extent, it can be assumed that the composition was fairly constant, and was in the proportions of—

Greenstuffs	1¼ lbs.
Pollard	1¾ lbs.
Bran	¾ lb.
Water	1⅞ lbs.

These were the weights of feed, mixed on 31st October, for the day's mash for two pens. This mash was halved, and 2 ozs. of bone meal were added to one half, while 1½ ozs. of ground rock phosphate were added to the other half, these amounts containing equal quantities of P_2O_5. Later, when the basic superphosphate was being tested, the total amount of mash was doubled, and two quarters received 2 ozs. of bone meal each, one quarter 1½ ozs. rock phosphate, and one quarter 3½ ozs. basic superphosphate.

Results.

The experiment was commenced on 26th September with chickens selected from two broods hatched on August 16 and 23 respectively. The chickens were healthy and strong, and were as even in size as could be obtained. They were weighed when first put in the pens, and then at fortnightly intervals, except for the first period, when a month elapsed between weighings, and the last period, which was extended to three weeks.

The weights at the different periods are given in Table 1:—

TABLE 1.

Lot.	26–9–29		24–10–29		7–11–29		22–11–29		5–12–29		27–12–29	
	lbs.	oz.	lbs.	oz.	lbs.	oz.	lbs.	oz.	lbs.	oz.	lbs.	oz.
1	12	14	22	6	26	6	31	7	41	0	49	7
2	13	0	21	3	25	6	30	12	40	2	47	7
3	...		...		27	6	30	14	41	5	48	14
4	...		...		26	7	30	9	40	8	48	7

Note:—

Lot 1 were those receiving bone meal.

Lot 2 those receiving phosphate.

Lots 3 and 4 were added when it was decided to include basic superphosphate in the test. They were chickens from the same broods, and had been receiving the ordinary mash, including bone meal, prior to their in-

clusion in the test. It was thought advisable to include a second pen on bone meal to compare with the basic superphosphate, so lot 3 were placed on the bone-meal mash, and lot 4 on the basic superphosphate.

The total amount of mash, including minerals, was increased by 50 per cent. in all lots on 22nd November, and this is reflected in the greatly increased gain at the following weighing, showing that, although the birds were receiving a plentiful supply of grain, the increase in the mash was needed.

Table 2 shows the increases in weight for each lot at the respective weighing periods, and Table 3 the total gains over the whole period of the experiment.

TABLE 2.

Lot.	24–10–29		7–11–29		22–11–29		5–12–29		27–12–29	
	lbs.	oz.	lbs.	oz.	lbs.	oz.	lbs.	oz.	lbs.	oz.
1	9	8	4	0	5	1	9	9	8	7
2	8	3	4	3	5	6	9	6	7	5
3	...		...		3	8	10	7	7	9
4	...		...		4	2	9	15	7	15

TABLE 3.

Lot.	26–9–29 to 27–12–29.		Lot.	7–11–29 to 27–12–29.	
	lbs.	ozs.		lbs.	ozs.
1	36	9	3	18	0
2	34	7	4	17	14

An inspection of these figures reveals that over the first month of the test Lot 1 made a somewhat greater gain than Lot 2. At the next three weighings the gains of the two lots were approximately equal, while at the last weighing Lot 1 again made a somewhat greater gain.

The total difference in gains at the end of the test was a matter of 2 lbs. 2 ozs. in the lots, a difference of 1.9 ozs. per bird.

In regard to Lots 3 and 4, the gains at the three weighings vary alternately in favour of each lot, but the difference at the end is only 2 ozs. between the total weights.

As it was thought that the sex of the birds probably had some effect on the relative weights, it was decided to make some attempt to adjust the weights to allow for this effect.

Table 4 shows the composition of each lot in regard to sex:—

TABLE 4.

Lot.	Black Orpingtons.		White Leghorns.	
	Male.	Female.	Male.	Female.
1	2	0	3	13
2	1	1	9	7
3	1	1	9	7
4	0	2	7	9

In order to arrive at some formula by which to adjust the weights, 12 males and 12 females of each breed from the same broods of chickens were weighed at the end of the test, and the average differences between the sexes in weight per bird were found and used to correct the weights of the several pens.

Table 5 gives the average difference in weight between the sexes, and Table 6 the adjusted weights for the pens:—

TABLE 5.

Breed.	Cockerels.		Pullets.		Difference.	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
Black Orpington ...	3	10·8	2	8·4	1	2·4
White Leghorn ...	3	1·4	2	7·2	0	10·2

TABLE 6.

Lot.	Real weights at 26–9–29		Real weights at 27–12–29		Weights adjusted by Table 5.		Gains on adjusted weights.	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
1	12	14	49	7	45	3·6	32	5·6
2	13	0	47	7	40	8·8	27	8·8

An inspection of this table reveals that the difference in gains between the two pens is increased slightly in favour of Lot 1, the difference now being 4 lbs. 12.8 ozs., or 4.27 ozs. per bird; again only a small difference.

It was not considered practicable to adjust the weights of Lots 3 and 4, as no allowance could be made for the almost certain difference between the sexes when their test commenced.

It remains to be stated that the birds in all lots appeared to be perfectly healthy, and showed no disparity to the eye between different groups.

Conclusion.

It is realised that the above experiment is by no means conclusive. Further experiments are therefore contemplated to eliminate doubtful points and to provide more definite information.

It is thought reasonable, however, to assume that if the addition of phosphates to the ration is taken to be necessary, ground rock phosphate of high grade or basic superphosphate will give almost, if not quite, as good results as sterile bone meal, at a greatly reduced cost.

BRAXY-LIKE DISEASE OF SHEEP IN WESTERN AUSTRALIA.

H. W. BENNETTS, M.V.Sc.,
Veterinary Pathologist.

The term "Braxy-like" was applied by Professor Dakin to a disease which apparently originated in the Great Southern District of this State about 1915. The disease was so named because of its similarity to Braxy, a disease affecting sheep in Europe.

It is now known that, apart from the occasional occurrence of an apparently identical disease in South Australia and New Zealand, the disease is peculiar to this State and quite distinct from Braxy, and from the Black Disease (Braxy-like) of the Eastern States.

The distribution of the disease in this State is a wide one. It is known from Kojonup and Gnowangerup in the South to Dowerin and Coorow in the North, and almost as far as Merredin in an Easterly direction.

The incidence of the disease varies greatly—different districts being affected in different years. The disease is definitely a seasonal one, mortality commencing with the advent of green feed, usually about May or June, and carrying on intermittently until October or November. (A condition which is probably identical with the one described does occasionally occur in sheep depastured on peas in the summer months—particularly after rain.)

Mortality is usually associated with improvement of pastures, and does not occur on uncultivated country. The apparent illness is of short duration, affected animals being usually found dead without evidence of a struggle. Carcases putrefy rapidly. The sheep which are attacked are almost invariably in good condition, and are usually the "best" in the flock. All breeds and both sexes are affected. The age of incidence is from about three months to full-mouth—occasionally older animals are affected. Young sheep are probably most susceptible. The percentage of deaths experienced in a flock may even reach 30 per cent.; individual losses of five per cent. for the season are quite common.

SYMPTOMS.

As previously mentioned the period between the onset of symptoms and death is very short, and usually the sheep are simply found dead.

The initial symptoms are a staggering gait with frequently "knuckling over." The affected animal appears excited, and often chews dirt, sticks, etc. Within half-an-hour or so the animal lies down, usually on its side with the head turned round on the flank. At this stage the sheep makes convulsive movements from time to time, especially if excited, and may actually get up and move to a fresh place. The breathing is usually rapid and shallow. Frothing at the mouth and grinding of teeth are common symptoms. Very soon the animal becomes unconscious, lies stretched out on its side, and dies quietly. Death usually occurs three or four hours after symptoms are first noticed—some animals show practically no symptoms, a few, on the other hand, may linger up to 24 hours. Some cases, particularly lambs, show a "nervous" form, the notable symptoms being convulsions and "galloping" movements. Most affected sheep show signs of scouring, and scoured droppings on sheep camps are often said to herald the approach of the trouble. Occasional cases have been known to recover, but a fatal termination is the general rule.

POST MORTEM FINDINGS.

Carcases of sheep which have just died show only slight departures from normal. There are more or less constant changes, but these are easily passed over by the untrained eye.

The paunch is usually fairly full, and the contents frequently show signs of excessive fermentation. The bowels are usually "inflamed" (congested) to a slight degree, and in a patchy sort of fashion. The gall bladder is usually distended with bile. The liver is somewhat softer than normal. The kidneys when cut across appear slightly congested. There are frequently small blood spots (petechiae) on the outside of the heart and large haemorrhages on the inner lining. Microscopically, there is evidence of degeneration in certain organs. The changes are those of a toxaemia, *i.e.*, there is a poison circulating in the blood and producing changes in many of the organs (kidneys, liver, heart, etc.).

CAUSE.

As a result of careful investigation it has been shown definitely that the cause of the disease is the very active growth of a soil germ (*Bacillus welchii*) in the contents of the small bowels of affected animals. The actively growing germ produces a toxin, or poison, which is absorbed from the bowel. In most instances death is due to the action of this toxin on the heart—resulting in heart failure. The toxin also acts on the brain and nervous system.

We have been able, with *B. welchii* or its toxin, to reproduce a disease in experimental sheep which appears identical with the natural one.

B. welchii is one of the most widely distributed soil organisms known, and is found in small numbers in the bowels of man and animals where it normally does no harm. If conditions arise which favour its growth in the small bowel (as sometimes happens in man), disease results.

In sheep affected with Braxy-like disease, we have estimated that there are as many as 10,000 million *B. welchii* in the contents of the small bowel. Using the same method we have been unable to detect the presence of any of these germs in the small bowel contents of healthy sheep from the same area. The small bowel contents from affected sheep have been shown to be very highly toxic because of the presence of *B. welchii* toxin (produced by the actively growing germs).

What factors are favouring the growth and production of *B. welchii* in the small bowel of affected sheep? We do not yet fully appreciate these "predisposing factors," but it appears that certain types of pasture eaten by sheep favour the growth of this germ in the bowel contents. The condition of the animal would also appear to be important; and the soil type appears to have some bearing on the appearance of the disease.

All these phases are being investigated experimentally in the field, and particularly at the Avondale State Farm where we are attempting to correlate chemical analyses of pastures and soil with the incidence of the disease.

METHODS OF CONTROL.

1. *Roughage.*—Turning sheep into bush country invariably prevents further losses (after the first few days), but is not very practicable in most instances. Very few sheep farmers are able to provide natural roughage for their sheep, so one has to resort to artificial measures.

As it appears that too "rich" a feed favours the disease, it is reasonable to recommend farmers to feed artificial roughage (hay, chaff, straw) to flocks in which mortality is occurring in order to balance the ration, and thereby control the disease. We hope to obtain some experimental evidence on this point.

2. *Management.*—Shifting sheep to different paddocks every few days frequently checks losses.

It appears that the ingestion of contaminated soil on, or with pasture, is an important factor in the production of the disease. Therefore, as far as possible, sheep should be managed so as to prevent their eating too close to the ground and thus picking up soil and with it numbers of the casual organism, *B. welchii.*

Compulsory daily exercise is recommended by some sheep owners who have experienced the trouble. Yarding of sheep or putting them into bare paddocks every night appears to prevent mortality, but is not practicable in most instances. Carcases should always be burnt, as they act as breeding grounds for *B. welchii,* and result in heavy contamination of the soil with the germ.

3. *Vaccine.*—Up to the present, preventive inoculation appears the most hopeful method of control, and the writer is attempting to perfect a vaccine for this purpose. A vaccine, produced in the laboratory, was tested in the field last year, and suggestive results were obtained.

Further tests are being carried out this season with an improved product, and it is hoped that this inoculation will prove an effective preventive measure.

Note.—Recent work has shown that the organism causing this disease, though very closely related to *B. welchii,* does not appear to be absolutely identical with it.

THE COST OF FEEDING PURE BRED COWS UNDER THE AUSTRALIAN OFFICIAL HERD RECORDING SCHEME.

G. K. BARON-HAY,
Superintendent of Dairying.

G. GAUNTLETT, B.Sc.(Agric.),
Agricultural Adviser.

During the past year records showing the details of rations fed to all cows under test have been carefully kept, and the cost of feeding for all cows in the Herd Recording Scheme is submitted.

During the year 16 pure bred herds have been tested, made up as follows:—Jersey, 6; Milking Shorthorn, 5; Guernsey, 4; Red Poll, 1.

Table 1 contains the data for the current year, which shows that production, cost of feeding and nett profit per cow from the sale of butter fat are remarkably close to the figures for 1929, the results from all years since 1924 being compared in Table 6.

A careful study of Table 1 brings out the fact that two main factors are concerned in the economical production of dairy produce:—1, Production of the cow. 2, Cost of Feeding.

1.—*Production of the Cow.*

It is obvious that the greater the production of the cow, the more economical will the production of butter fat or milk be; provided correct feeding methods are practised. Comparing herds A and O, it will be seen that the cost of feeding is equal, but that the average production of Herd A is double that of Herd O. One would, at first sight, expect the profit over cost of feeding in Herd A to be double that of Herd O, but this is not so, the profit being more than five times as great.

This is because the maintenance ration required for cows in each herd is approximately the same, and approximates to 46.5 per cent. of the ration, or a cost of £7 15s. 5d. before any return from the cow can be expected. In Herd O two cows are required to produce as much fat as one in Herd A, which is equivalent to an expenditure of £7 15s. 5d. × 2 = £15 10s. 10d. for maintenance in Herd O to produce the same amount of butter fat. It is for this reason that high producers, economically fed, produce dairy products relatively very cheaply to low producers.

COMPARISON OF HERD A. AND O.

	Yield of Fat per Cow.	Cost of Feed per Cow.	Profit per Cow.
	lbs.	£ s. d.	£ s. d.
Herd A.	435·65	16 14 2	23 4 4
Herd O.	222·08	16 15 8	4 10 9
Difference ...	213·57	0 1 6	18 13 7

2.—*Cost of Feeding.*

The capacity of high production in dairy cows is one that calls for continued effort and skill on the part of the breeder of milch cattle to maintain and improve, and provided feeding is carried out adequately, is not immediately under the control of the dairy farmer.

The capacity for high yield inherent in cows may, however, be nullified by expensive systems of feeding being practised by the owner, as a comparison of Herds C and J makes apparent.

COMPARISON HERDS C. AND J.

	Average Fat per Cow.	Cost of Feeding per Cow.	Profit per Cow.
	lbs.	£ s. d.	£ s. d.
Herd "C."	382·85	27 7 10	7 10 4
Herd "J."	257·83	9 5 8	14 1 8
Difference ...	— 125·02	— 18 2 2	+ 6 11 4

Herd C with a production of 125 lbs. of butter fat more than Herd J, returned £6 11s. 4d. less profit, solely due to expensive methods of feeding. The owner of Herd J grows nearly all the cows require on the farm, while the owner of Herd C purchased practically all feeds, including roughages. A further comparison of two herds, with a similar production, also brings out the importance of carefully scruitinising the costs of feeding dairy cattle.

COMPARISON OF HERDS L AND M.

——	Butter Fat per Cow.	Cost of Feed per Cow.	Profit per Cow.
	lbs.	£ s. d.	£ s. d.
Herd L.	252	10 18 8	11 18 6
Herd M.	252	17 4 10	5 3 9
Difference ...	...	— 6 6 2	+ 6 14 9

The above comparison shows that with herds of any medium producing capacity good profits are possible where the cost of feeding is studied.

A comparison of the three main breeds under test will be of interest, though the writers do not intend this comparison to be regarded controversially.

——	Average Yield of Butter Fat.	Average Cost of Feed.	Average Profit as Fat over Cost of Feed.	Average Profit as Milk over Cost of Feed.
	lbs.	£ s. d.	£ s. d.	£ s. d.
Guernsey (4 herds) ...	302·00	15 3 6	12 6 10	15 17 10
Milking Shorthorn (5 herds)	298·40	16 18 5	11 8 2	22 7 10
Jersey (6 herds)	301·17	14 6 7	13 1 1	16 6 4

The results show that the average yields of herds from the three breeds are remarkably even, and, as might be expected, the larger breeds costing more to feed on the average; the Jersey leading for the production of butter fat, closely followed by the Guernsey and Milking Shorthorn. For the production of milk, however, the Milking Shorthorn leads easily, as might be expected.

Table 6 shows the results of seven years recording, and may be taken, therefore, as a reasonably true average, as all cows have been included when working out returns for any one year, irrespective of ages, production or failure to reach the standards laid down by the rules of the Pure Bred Recording Scheme.

The following is a digest of Table 6, giving the main items for years 1924-1930:—

Average Yield per Cow.		Average Value of Skim Milk.	Average Cost of Feed per Cow for period.	Average Profit per Cow at average Price of Butter Fat.	Average Profit where Milk sold at 1s. 3d. gallon.	Average Cost of Feed to produce 1lb. Butter Fat.	Average Cost to produce 1 gallon of Milk.
Milk.	Butter Fat.						
gals.	lbs.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.	pence.
619	300·21	3 3 3	14 3 8	12 19 1½	17 6 2	11·42	5·54

In order to facilitate the study of the results, the following extracted information is supplied:—

Table 1.—Herds in order of merit as Butter Fat Producers and Costs of Production.
Table 2.—Average Results for Year 1930.
Table 3.—Herds in order of merit as Producers of Milk.
Table 4.—Herds arranged to show Cost of Feed per 100 lbs. of Fat.
Table 5.—Herds arranged to show Cost of Feed per 1 gallon of Milk.
Table 6.—Average costs for 7 years, 1924-1930.

TABLE I.—HERDS IN ORDER OF MERIT AS PRODUCERS OF BUTTER FAT.

Columns	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Herd.	Average Fat per Cow for period of 9 months.	Average Skim Milk per Cow for period.	Value of Fat at 1/7½ per lb. (average price).	Value of Skim Milk for period at 2d. per gallon.	Average Value of Fat and Skim Milk for period.	Cost of Feed per Cow for the period.	Profit per Cow for period by Sale of Fat.	Value of whole Milk at 1/3 per gallon after allowing for rearing Calf.	Profit per Cow by Sale of Fresh Milk at 1/3 per gallon.	Cost of Feed for 100lbs. of Fat.	Cost of Feed per 1 gallon of Milk.
	lbs.	gall.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d	£ s. d	£ s. d.	pence.
A. W. Padbury ... A	435·65	543	35 8 0	4 10 6	39 18 6	16 14 2	23 4 4	44 4 0	27 9 10	3 16 19	4·20
W. G. Burges ... B	418·82	679	34 0 7	5 13 2	39 13 9	16 6 0	23 7 9	52 11 0	36 5 0	3 17 11	4·10
Mrs. Burnside ... C	382·85	456	31 2 2	3 16 0	34 18 2	27 7 10	7 10 4	38 7 1	10 19 3	7 3 1	9·34
E. McManus ... D	350·48	573	28 9 6	4 15 6	33 5 0	17 3 9	16 1 3	45 5 0	27 18 9	4 18 1	4·93
G. F. Coombes ... E	338·57	423	27 10 2	3 10 6	31 0 8	9 0 1	22 0 7	35 13 6	26 13 5	2 12 5	3·23
P. Rose ... F	300·40	388	24 8 11	3 3 6	27 11 7	10 2 5	17 9 2	32 1 4	14 11 2	3 7 5	3·90
C. Ironmonger... G	274·71	322	22 6 5	2 13 8	25 0 1	12 17 9	12 2 4	28 11 0	15 13 3	4 3 10	5·54
Wooroloo ... H	267·66	430	21 14 11	3 11 8	25 6 7	16 12 8	8 13 11	35 1 4	18 18 8	6 4 3	5·88
Muresk I	264·48	307	21 9 9	2 11 2	24 0 11	17 3 4	6 17 7	27 9 0	10 5 8	6 9 10	7·62
R. H. Rose ... J	257·83	290	20 19 0	2 8 4	23 7 4	9 5 8	14 1 8	26 6 4	17 0 8	3 12 0	4·27
A. W. Wilson ... K	255·34	299	20 14 11	2 9 10	23 4 9	15 17 10	7 6 11	26 15 10	10 18 0	6 4 6	7·17
Johnson & Giblett ... L	252·23	284	20 9 10	2 7 4	22 17 2	10 18 8	11 18 6	25 16 7	14 17 1	4 6 8	5·10
W. Padbury ... ... M	252·19	233	20 9 9	1 18 10	22 8 7	17 4 10	5 3 9	22 18 5	15 13 7	6 16 9	9·02
Hospital for Insane ... N	233·07	376	18 18 9	3 2 8	22 1 5	17 13 11	4 7 6	31 3 0	13 9 1	7 11 10	6·87
H. T. Dunkley ... O	222·08	393	18 0 11	3 5 6	21 6 5	16 15 8	4 10 9	32 11 0	15 5 3	7 11 2	6·33
H. G. Walton ... P	213·29	291	17 6 7	2 8 6	19 15 1	11 19 10	7 15 3	24 15 4	12 15 6	5 12 5	5·50
Averages ...	294·98	369	23 19 6	3 5 4	27 4 10	14 10 3	12 0 10	30 3 3	15 13 0	5 6 2	5·10

Oaten or wheaten chaff, £5 ton ; Bran, £8 10s. 0d. ton ; Pollard, £8 10s. 0d. ton ; Crushed Oats, 3/– bushel ; Linseed Meal, £13 10s. 0d. ton ; Lucerne pasture, 3/– week ; Lucerne Hay, £7 ton ; Green Maize, 7/– ton ; Silage, 7/– ton ; Brewers Grains, 6d. bush ; Pasture, 1/6 week ; Sudan Grass Pasture, 3/ week or 7/– per ton ; Subterranean Clover pasture, 3/– week ; Green Lucerne, £2 ton ; Barley, green, 7/– ton or 3/– week as pasture ; Clover Hay, £3 10s. 0d. per ton.

TABLE 2.—AVERAGES OF ALL COWS RECORDED, 1930.

1. 637 gallons of milk and 294.98 lbs. of butter fat.
2. 369 gallons of skim milk per cow.
3. Value of butter fat, at 1s. 7½d. per lb.—£23 19s. 4d.
4. Value of skim milk available for pig feeding—£3 5s. 6d.
5. Total credits to cow by sale of fat and skim milk—£27 4s. 10d.
6. Cost of feed for period—£14 10s. 3d.
7. Profit by sale of butter fat after deducting feed costs—£12 14s. 7d.
8. Value of whole milk at 1s. 3d. per gallon—£30 3s. 3d.
9. Profit by sale of fresh milk at 1s. 3d. per gallon after deducting cost of feed—£15 13s.
10. Cost of feed per 100 lbs. butter fat produced—£5 6s. 2d.
11. Cost of feed per gallon of milk produced—5.10d.

TABLE III.—HERDS IN ORDER OF MERIT AS PRODUCERS OF MILK, 1930.

Herd.	Milk Average.	Butter Fat Average.	Cost of Feed per Cow.	Profit as Milk.	Profit as Fat and Skim Milk.	Cost to Produce 100 lbs. Fat.	Cost to Produce 1 gallon Milk.
	gall.	lbs.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.
B	954	418·82	16 6 0	36 5 0	23 7 9	3 17 11	4·10
D	837	350·48	17 3 9	27 18 9	16 1 3	4 18 1	4·93
A	803	435·65	16 4 2	27 9 10	23 4 4	3 16 9	4·20
C	707	382·85	27 7 10	10 19 3	7 10 4	7 3 1	9·34
H	678	267·66	16 12 8	18 18 8	8 3 11	6 4 3	5·88
E	670	338·57	9 0 1	26 13 4	22 0 7	2 12 5	3·23
O	637	222·08	16 15 8	15 15 3	4 10 9	7 11 2	6·33
F	623	300·40	10 2 5	14 11 2	17 9 2	3 7 5	3·90
N	618	233·07	17 13 11	7 11 10	4 7 6	7 11 10	6·87
G	558	274·71	12 17 9	15 13 3	12 2 4	4 13 10	5·54
I	541	264·48	17 3 4	10 5 8	6 17 7	6 9 10	7·62
K	532	255·34	15 17 10	10 18 0	7 6 11	6 4 6	7·17
P	523	213·29	11 19 10	12 15 6	7 15 3	5 12 5	5·50
J	522	257·83	9 5 8	17 0 8	14 1 8	3 12 0	4·27
L	515	252·23	10 18 8	14 17 1	11 18 6	4 6 8	5·10
M	459	252·19	17 4 10	15 13 7	5 3 9	6 16 9	9·02
Averages ...	636	294·98	£15 4 0	£15 13 0	£12 14 7	£5 6 2	5·10

TABLE IV.—HERDS IN ORDER OF MERIT SHOWING COST OF FEED PER 100 LBS. OF FAT, 1930.

Herd.	Cost of Feed per 100 lbs Fat.	Under Average.	Over Average.
	£ s. d.	£ s. d.	£ s. d.
E	2 12 5	2 13 7	
F	3 7 5	1 18 9	
J	3 12 0	1 14 2	
A	3 16 9	1 9 5	
B	3 17 11	1 8 3	
L	4 6 8	0 19 6	
G	4 13 10	0 12 4	
D	4 18 1	0 8 1	
P	5 12 5	...	0 6 3
H	6 4 3	...	0 18 1
K	6 4 6	...	0 18 4
I	6 9 10	...	1 3 8
M	6 16 9	...	1 10 7
C	7 3 1	...	1 16 11
O	7 11 2	...	2 5 0
N	7 11 10	...	2 5 8

Average of all herds—£5 6s. 2d. per 100lbs. Fat.

TABLE V.—HERDS IN ORDER OF MERIT SHOWING COST OF FEED PER ONE GALLON OF MILK PRODUCED.

Herd.	Cost of Feed per 1 gallon of Milk.	Under Average.	Over Average.
	pence.	pence.	pence.
E	3·23	1·96	
F	3·90	1·29	
B	4·10	1·09	
A	4·20	0·99	
J	4·27	0·92	
D	4·93	0·26	
L	5·10	0·09	
P	5·50	...	0·31
G	5·54	...	0·35
H	5·88	...	0·69
O	6·33	...	1·14
N	6·87	...	1·68
K	7·17	...	1·98
I	7·62	...	2·43
M	9·02	...	3·83
C	9·34	...	4·15

Average of all herds—5·19d. per gallon.

TABLE VI.—HERD AVERAGES FOR SEVEN YEARS, 1924–1930.

Year.	Milk.	Average Fat per Cow for period of 9 months.	Average Skim Milk per Cow for period.	Value of Fat for period.	Value of Skim Milk for period at 2d. per gallon.	Average Value of Fat and Skim Milk for period.	Cost of Feed per Cow for period.	Net Profit per Cow for period through Sale of Fat.	Value of whole Milk at 1/3 per gallon allowing for rearing Calf.	Net Profit per Cow through Sale of Fresh Milk at 1/3 per gallon.	Average Cost to Produce 1lb. Fat.	Average Cost to produce 1 gall. Milk.
	gallons.	lbs.	lbs.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.	pence.
1930 ...	636	294·98	369	23 19 6	3 5 4	27 4 10	14 10 3	12 14 7	30 3 3	15 13 0	12·74	5·10
1929 ...	629	295·10	386	At 1/8 per lb. 24 11 10	3 4 4	27 16 2	15 1 0	12 15 2	33 6 9	18 5 9	12·24	5·74
1928 ...	592	280·56	353	At 1/7½ per lb. 22 15 9	2 18 10	25 14 7	15 11 4	10 3 3	30 19 0	15 7 8	13·34	6·34
1927 ...	602	290·72	362	At 1/7 per lb. 23 0 4	3 0 4	26 0 8	14 10 5	12 6 8	31 10 6	17 0 1	12·00	5·79
1926 ...	624	312·01	393	At 1/7 per lb. 24 14 0	3 5 6	27 19 6	14 14 7	13 4 11	32 5 5	17 10 10	11·15	5·66
1925 ...	652	308·59	407	At 1/5½ per lb. 22 10 0	3 7 10	25 17 10	14 13 2	11 4 8	30 10 5	15 9 5	10·77	6·15
1924 ...	600	319·50	362	At 1/7½ per lb. 25 19 2	3 0 4	28 19 6	10 4 10	18 4 8	32 1 3	21 16 5	7·7	4·09
Average for 7 years ...	619	300·21	376	£23 18 2	£3 3 3	£27 1 10	£14 3 8	£12 19 1½	£31 10 11	£17 6 2	11·42	5·54

During the year several notable records have been made by pure bred cows under the Recording Scheme; two West Australian records for the Milking Shorthorn breed having been established, and what is believed to be an Australian record for a senior two-year old Guernsey cow.

Hope 3rd of the Hill, owned by Mr. W. G. Burges, Tipperary, York, in producing, at four years eight months of age, 13,423 lbs. of milk and 606 lbs. of butter fat in 273 days, created a new State record for her breed.

Hope 3rd of the Hill, Vol. 8, 4 years 8 months, born January 6, 1925, owned by W. G. Burges, "Tipperary," York, W.A.

Production: 13,423 lbs. milk, 606 lbs. butter fat, in 273 days.

1st Prize Perth Royal, 1927.
1st " " 1928.
2nd " " 1929.
2nd Type and Utility, 1929.

1st Prize, Milking Competition, Perth Royal Show, 1929, producing 604 lbs. milk in 24 hours.

2nd Prize, Butter Fat Competition, Perth Royal Show, 1929, producing 2.823 butter fat in 24 hours.

The following particulars regarding the lactation period are of interest:—

Date of Test.	Milk for day.	Butter Fat for day.	Milk for sub-period.	Butter Fat for subperiod.
	lbs.	lbs.	lbs.	lbs.
October 1, 1929	63	2·871	1,890	86·13
November 5, 1929 ...	63·5	2·604	1,905	88·12
December 3, 1929	58	2·404	1,740	72·12
January 7, 1930	53	2·301	1,590	69·03
February 4, 1930	51	2·292	1,530	68·76
March 4, 1930	45	2·085	1,350	62·55
April 1, 1930	39	1·735	1,170	52·05
May 7, 1930	37	1·753	1,110	52·59
June 4, 1930	34·5	1·656	1,138	54·65

Hope 3rd of the Hill commenced her lactation period on 18th September, 1929, the record being produced during a summer of unusual severity for this district.

This was only made possible through the use of silage, made from oats and peas, which was fed during the greater part of this cow's lactation. In creating this second record, no effort was made by Mr. Burges to depart from the ordinary breeding programme, Hope 3rd carrying a calf for seven months of her test, and has calved regularly each year, as follows:—October 4, 1927, bull; October 20, 1928, bull; September 15, 1929, heifer.

It is interesting to note that this cow completed two lactation records in 1929-1930, each of which was the highest in her class. As a senior three-year old, Hope 3rd produced 13,182 lbs. milk and 577.15 lbs. butter fat. An equally meritorious performance was recorded by Mr. A. W. Padbury's Guernsey cow, Koogan Bonnie Jean, 1,612, who created an Australian record for the breed by yielding 8,164 lbs. milk and 505.39 lbs. of butter fat in 273 days, at two years seven months.

This yield of butter fat exceeds the previous record by 19 lbs., recorded by Parson's Red Rose 20th of Wollongbar, owned by the Department of Agriculture, New South Wales.

In this instance, also, another lactation period has commenced 11 months after the previous calving date, which shows that Bonnie Jean was carrying a calf for seven months of the testing period.

Koogan Bonnie Jean is a daughter of Robin of Nundorah, winner for the third time in succession of the prize for the bull who has sired the greatest number of daughters to attain the standards set for butter fat by the Official Recording Scheme. This bull has eight daughters who have produced an average of 411.36 lbs. of butter fat each, a magnificent record, branding Robin of Nundorah as an outstanding sire of the Guernsey breed.

It is now the property of Mr. Nelson, Group 21, Jardee.

The following particulars regarding the lactation period are of interest:—

Date of Test.	Milk for day.	Butter Fat for day.	Milk for sub-period.	Fat for sub-period.
	lbs.	lbs.	lbs.	lbs.
November 18, 1928 ...	38	2·112	1,140	63·36
December 11, 1928 ...	35	2·020	1,050	60·60
January 15, 1929	30·5	1·829	915	54·87
Feburary 12, 1929 ...	29	1·838	870	55·14
March 21, 1929	26	1·473	780	44·19
April 16, 1929	25½	1·473	765	52·29
May 14, 1929	24·5	1·698	735	50·94
June 13, 1929	29	1·874	870	56·22
July 18, 1929	31·5	2·054	1,039	67·78

In producing this record, also. silage was extensively used during the summer months to supply succulence in the feed, the regularity of production during the summer months being an indication of its value as a milk producer.

HERD TESTING.

THE OFFICIAL AUSTRALIAN PURE BRED DAIRY CATTLE PRODUCTION TESTING SCHEME.

Conducted by Dairy Branch, Department of Agriculture, Year ended 30th June, 1930.

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.	Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last Day.	Sire.
				Years. Mths.			lbs.	%	lbs.	lbs.	
MATURE COWS—STANDARD 350 LBS. BUTTER FAT.											
Melba 42nd of Darbalara ...	W. G. Burges ...	M.S. ...	12134	7 4	23-12-28	273	12,419	4·54	563·89	41½	Limelight of Darbalara—1105
Virginia 20th of Darbalara ...	do.	do. ...	14858	5 11	18-8-29	273	11,098	4·41	489·70	19½	Expe.t of Darbalara
Royals Camelia of Wongara ...	do.	do. ...	14560	6 1	29-8-29	273	10,956	4·25	466·21	27	Royal of Arrawatta—555
Starbright's Duchess of Glen Iris	Mrs. Burnside ...	Jersey ...	14176	5 11	24-8-29	273	8,043	5·66	455·86	16	Sweetbread's Duke of Glen Iris —1918
Matilda 7th of Berry ...	W. G. Burges ...	M.S. ...	14074	5 5	16-6-29	273	9,970	4·58	451·30	18½	Rutland of Darbalara- 575
Morden Lady II. of Koojan ...	A. W. Padbury ...	Guernsey...	918	6 4	13-12-28	273	7,326	5·54	406·18	22	Gay Lad's Golden Dawn of Guildford- 162
Madame 34th of Darbalara ...	W. G. Burges ...	M.S. ...	14,032	5 8	14-10-28	273	8,169	4·90	401·10	18	Stockwell of Darbalara—1850
Topsy Rye of Grass Vale ...	C. H. Ironmonger	Jersey ...	15702	5 11	20-6-29	273	6,754	5·79	391·40	16½	Rye Duke of Glen Iris—1994
Lily of Grass Vale	Mrs. Burnside ...	do. ...	8947	8 1	14-10-28	273	7,762	4·84	376·31	16½	Noble Fondant of Garden Hill —2268
Bonnet 2nd of Berry ...	W. G. Burges ...	M.S. ...	13168	6 5	17-2-29	240	8,160	4·60	375·36	20	Newhaven of Darbalara—1174
Dinah 2nd of Wollongbar ...	Dept. of Agriculture	Guernsey...	832	7 7	2-9-29	273	7,563	4·78	361·75	16	Judge of Wollongbar—184
Minnamurra Holly	Muresk Agricultural College	do. ...	953	6 5	23-6-29	273	7,885	4·39	346·80	18½	Minnamurra's Favourite's Prince - 294
Wollongbar Dessie 2nd ...	do. do.	do. ...	1121	5 2	4-6-29	273	6,639	5·16	342·91	13	Bellman of Wollongbar—334
Jean of Moorlands	P. Rose	Jersey ...	13531	5 11	21-5-29	273	6,999	4·85	340·07	8	Reveller of Melrose—1804
Pearl 3rd of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	8 8	2-8-29	273	9,519	3·54	337·78	23	Norval of Darbalara—498
Cowslip 6th of Darbalara ...	W. G. Burges ...	do. ...	13348	6 1	6-10-28	273	7,335	4·60	337·73	15	Windsor of Darbalara—1444
Boronia Rye of Grass Vale ...	L. H. Ironmonger	Jersey ...	17529	5 8	22-4-29	273	7,565	4·4	332·92	18½	Rye Duke of Glen Iris—1994
Velvet of Wollongbar ...	Dept. of Agriculture	Guernsey...	774	8 3	5-11-28	273	7,851	4·21	330·98	17	Faithful Fido of Wollongbar—81
Belle 4th of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	5 5	25-8-29	273	8,454	3·89	329·50	8	Telyarup Prince of Claremont—2352
Jane of Moorlands	P. Rose	Jersey ...	13530	6 9	13-3-29	273	6,427	4·85	312·25	12½	Reveller of Melrose—1804
Molly 4th of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	7 5	2-12-28	273	7,695	3·91	301·30	20	Morven York Rose 5th
Wollongbar Realm 2nd ...	Muresk Agricultural College	Guernsey...	1151	5 8	7-7-29	273	6,537	4·53	296·13	9	Bellman of Wollongbar 334
Dover 5th of Kelvin Park ...	Hospital for Insane	M.S. ...	Vol. 8	5 10	25-8-29	273	7,233	4·04	292·26	11	Daddy Xmas of Croobyar—928
Maid of Moorlands	P. Rose	Jersey ...	20896	7 3	12-4-29	210	6,195	4·63	287·37	23½	Reveller of Moorlands—1804
Parson's Red Rose 31st of Wollongbar	Dept. of Agriculture	Guernsey...	985	6 5	14-4-29	273	5,487	4·95	271·67	14	Rose Boy of Wollongbar—316
Hope of Moorlands	P. Rose	Jersey ...	13529	6 7	1-4-29	273	5,535	4·80	270·68	10	Reveller of Melrose—1804
Makanora of Grass Vale ...	C. H. Ironmonger	do. ...	12257	6 11	13-5-29	273	5,685	4·66	265·10	15	Makarini 995
Cream Duckess of Grass Vale	G. F. Coombs ...	do. ...	17531	5 10	8-7-29	240	4,740	5·48	259·90	6½	Rye Duke of Glen Iris—1994
Gladness 2nd of Wollongbar ...	Dept. of Agriculture	Guernsey...	631	7 9	1-2-29	273	4,759	5·42	258·14	11½	Faithful Fido of Wollongbar 81
Grantara Sadie	H. G. Walton ...	Red Poll...	1233A	6 2	28-6-29	273	5,679	4·19	238·34	8	Victoria Werribee- 516A
Fairy 7th of Newstead ...	T. H. Dunkley ...	M.S. ...	13605	6 11	10-9-29	210	6,045	3·71	224·25	14½	Supreme of Burradale
Grantara Jacinth	H. G. Walton ...	Red Poll ...	1231A	5 5	6-8-29	210	5,835	3·63	212·16	10½	Victoria Werribee—5116A

Fanny of Moorlands	P. Rose	Jersey ...	14343	6	1	21–5–29	180	4,455	4·57	203·91	20½	Noble's Advance of Garden Hill —2273
Countess 6th of Berry ...	T. H. Dunkley ...	M.S. ...	13347	7	6	4–8–29	240	6,195	3·16	196·35	10½	Melba's Emblem of Darbalara —461
Mercedes Sweet Ginger of Glen Iris	W. Padbury ...	Jersey ...	16679	5	0	27–9–29	150	3,315	4·66	154·53	15½	Mercedes Sweet Duke of Glen Iris—2982
Noreen 2nd of Garden Hill ...	do.	do. ...	17951	5	5	1–4–29	90	2,145	4·70	100·98	21½	Cream Socks of Glen Iris—1410
COWS OVER 4½ YEARS AND UNDER 5 YEARS—STANDARD 325 LBS. BUTTER FAT.												
Hope 3rd of the Hill ...	W. G. Burges ...	M.S. ...	Vol. 8	4	8	15–9–29	273	13,423	4·44	606·00	34½	Crescent of the Hill—2016
Koojan Dulcie	A. W. Padbury ...	Guernsey...	1255	4	11	10–3–29	273	10,036	5·71	573·94	30½	Robin of Nundorah—417
Rose 18th of Darbalara ...	W. G. Burges ...	M.S. ...	Vol. 8	4	8	30–5–29	273	10,287	4·44	457·22	19	Victor of Darbalara—2384
Dahlia 5th of Berry ...	do.	do. ...	Vol. 8	4	11	16–2–29	273	9,451	4·56	431·77	30½	Mirth of Berry—1716
Tessie of Garden Hill ...	W. Padbury ...	Jersey ...	17957	4	9	22–6–29	273	6,258	5·16	322·92	16	Cream Socks of Glen Iris
Spurfield Alma	Muresk Agricultural College	Guernsey...	1049	4	7	6–6–29	273	6,661	4·63	308·47	10½	Milton's Steadfast—292
Helen of Moorlands	P. Rose	Jersey ...	17961	4	7	25–3–29	210	5,040	5·44	274·41	19	Top Notch of Roelands—4011
Lassie Fowler of Moorlands ...	do.	do. ...	17963	4	7	1–5–29	273	5,200	5·07	263·74	8½	Grafter of Melrose—3560
Spurfield Air Girl 2nd ...	Muresk Agricultural College	Guernsey...	1,048	4	10	3–3–29	273	4,791	5·47	261·98	17	Milton's Steadfast—292
Wollongbar Bonnie Pearl ...	Dept. of Agriculture	do. ...	1165	4	7	31–1–29	273	4,606	5·42	249·65	10½	Bounty of Wollongbar—336
COWS OVER 4 YEARS AND UNDER 4½ YEARS—STANDARD 300 LBS. BUTTER FAT.												
Melba 69th of Darbalara ...	W. G. Burges ...	M.S. ...	Vol. 8	4	5	5–5–29	273	10,486	4·5	472·60	25½	Re-Echo of Darbalara—2254
Koojan Dame	Dept. of Agriculture	Guernsey...	1252	4	5	9–11–28	273	10,911	4·26	465·01	27	Robin of Nundorah—417
Lady Fowler 3rd of Grass Vale	R. H. Rose ...	Jersey ...	19111	4	1	27–6–29	273	8,115	5·43	440·85	10	Rye Duke of Glen Iris—1994
Lydia of Moorlands	P. Rose	do. ...	19107	4	4	3–5–29	273	6,721	4·57	307·57	5½	Top Notch of Roelands—4011
Grass Vale Fairy Rye ...	C. H. Ironmonger	do. ...	23689	4	3	8–9–29	273	6,660	4·49	299·40	15	Rye Duke of Glen Iris—1994
Wollongbar Golden Pearl 5th	Muresk Agricultural College	Guernsey...	1128	4	5	2–3–29	273	4,926	5·94	292·66	17	Judge of Wollongbar—184
Searchlight's Royal Swallow of Wangara	T. H. Dunkley ...	M.S. ...	14966	4	1	17–4–29	240	7,215	3·31	239·28	12½	Searchlight of Darbalara—2301
Grantara Hetty	H. G. Walton ...	Red Poll ...	1593A	4	1	2–7–29	273	5,263	4·14	218·14	4½	Grantara Lysander—496A
Sweet Duchess of Grass Vale	R. H. Rose ...	Jersey ...	23692	4	1	24–9–29	240	3,825	4·98	190·50	4	Starbright's Sweet Duke of Glen Iris—3710
COWS 3½ YEARS AND UNDER 4 YEARS—STANDARD 275 LBS. BUTTER FAT.												
Hope 3rd of the Hill ...	W. G. Burges ...	M.S. ...	Vol. 8	3	9	20–10–28	273	13,182	4·38	577·15	29	Crescent of the Hill—2016
Pansy 5th of the Hill ...	do.	do. ...	Vol. 8	3	10	2–12–28	273	11,607	4·13	480·35	34	Crescent of the Hill—2016
Maggie 4th of Kurrawong ...	do.	do. ...	Vol. 8	3	7	29–9–29	273	8,688	4·60	400·32	21	Premier of Kurrawong—1212
Royal Lady of Kurrawong ...	do.	do. ...	Vol. 8	3	7	13–11–28	273	9,645	4·08	393·99	35	Count Hughes of Cosey Camp —2011
Bloom of Moorlands	P. Rose	Jersey ...	20889	3	11	22–5–29	273	6,079	5·29	322·04	6½	Grafter of Melrose—3560
Beryl of Moorlands	do.	do. ...	20886	3	10	10–5–29	273	6,952	4·52	314·29	7½	do. do.
Bud of Moorlands	do.	do. ...	20888	3	9	17–5–29	273	6,081	5·0	304·65	12	do. do.
Hazel of Moorlands	do.	do. ...	20891	3	10	12–5–29	273	6,093	4·72	288·13	6	do. do.
Denmark Red Rose	Dept. of Agriculture	Guernsey...	1357	3	8	6–3–29	273	4,671	5·81	271·63	12	Rose Chief of Wollongbar—130
Grantara Daisy	H. G. Walton ...	Red Poll ...	1591A	3	10	1–8–29	273	6,246	4·30	268·88	12	Grantara Lysander—496A
Denmark Rose Pearl 1st ...	Dept. of Agriculture	Guernsey...	1430	3	8	19–7–29	273	4,863	5·50	267·56	11	Rose Chief of Wollongbar—130
Silvermine 2nd of Garden Hill	W. Padbury ...	Jersey ...	20879	3	11	25–9–29	273	4,690	5·39	253·00	18½	Cream Socks of Glen Iris—1410
Flynn 7th of Claremont ...	Hospital for Insane	M.S. ...	15066	3	11	15–9–29	273	6,603	3·81	251·81	11	Telyarup Prince of Claremont —2352

HERD TESTING, ETC.—*continued.*

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.		Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last Day.	Sire.
				Years.	Mths.			lbs.	%	lbs.	lbs.	
COWS 3 YEARS AND UNDER 3½ YEARS—STANDARD 250 LBS. BUTTER FAT.												
Koojan Wavelet	A. W. Padbury ...	Guernsey...	1619	3	1	6-9-29	273	7,785	5·5	428·32	26	Robin of Nundorah—417
Koojan Dorothy	do. ...	do. ...	1613	3	3	23-9-29	273	8,361	4·99	416·94	27	Koojan Golden Governor—595
Kathleen 5th of Kurrawong...	W. G. Burges ...	M.S. ...	Vol. 8	3	2	15 2-29	273	8,875	4·32	383·49	18½	Premier of Kurrawong—1212
Daphne 7th of the Hill ...	do.	do. ...	Vol. 8	3	4	6-9-29	273	8,520	4·16	354·29	25	Crescent of the Hill 2016
Starbright's Daisy of Grass Vale	C. H. Ironmonger	Jersey ...	20873	3	3	13 11-28	273	8,019	4·27	342·69	23	Starbright's Sweet Duke of Glen Iris—3710
Koojan Dolly	A. W. Wilson ...	Guernsey...	1254	3	4	10-10-28	273	7,717	4·25	328·23	22½	Robin of Nundorah—417
Pride 4th of Kurrawong ...	W. G. Burges ...	M.S. ...	Vol. 8	3	3	14 2-29	273	8,229	3·79	312·34	23	Premier of Kurrawong—1212
Denmark Rosa	Dept. of Agriculture	Guernsey...	1429	3	4	15-4-29	273	5,880	5·26	309·70	20	Rose Chief of Wollongbar 130
Carnation of Minnathorpe ...	E. McManus ...	M.S. ...	Vol. 8	3	1	27-5-29	273	6,306	4·67	294·80	17	Bruce of Sunnyvale
Koojan Colleen	A. W. Wilson ...	Guernsey...	1293	3	3	27-11 28	240	5,670	5·06	287·19	10½	Robin of Nundorah- 417
Golden Cream 2nd of Grass Vale	R. H. Rose ...	Jersey ...	N.Y.A.	3	4	22-8-29	273	5,479	5·14	281·68	11½	Rye Duke of Glen Iris—1994
Jess of Grass Vale	C. H. Ironmonger	do. ...	20872	3	5	15 1-29	273	5,728	4·64	265·87	9½	Starbright's Sweet Duke of Glen Iris—3710
Lady Fowler 6th of Grass Vale	R. H. Rose ...	do. ...	N.Y.A.	3	1	29-7-29	273	5,022	4·88	245·32	9	Carnation's Masterpiece of Grass Vale
Star Lady of Grass Vale ...	do.	do. ...	N.Y.A.	3	3	8-9-29	273	4,044	5·73	231·82	8	Carnation's Masterpiece of Garden Hill
Tessie 2nd of Garden Hill ...	W. Padbury ...	do. ...	20882	3	4	12-3-29	240	3,540	6·23	220·77	12	Cream Socks of Glen Iris—1410
Grass Vale Fairy Rye ...	C. H. Ironmonger	do. ...	23689	3	5	10 11-28	210	4,800	4·56	218·89	15½	Rye Duke of Glen Iris—1994
Pansy 2nd of Garden Hill ...	W. Padbury ...	do. ...	20879	3	5	12 3-29	120	1,935	5·85	113·31	15	Paymaster of Garden Hill—4302
HEIFERS OVER 2½ YEARS AND UNDER 3 YEARS—STANDARD 225 LBS. BUTTER FAT.												
Koojan Bonnie Jean ...	A. W. Padbury ...	Guernsey...	1612	2	7	18 10 28	273	8,164	6·19	505·39	31½	Robin of Nundorah 417
Moorlands Ada ...	P. Rose	Jersey ...	23679	2	11	12 5-29	273	7,563	5·26	398·12	16	Colonel of Melrose—4015
Crantock's Lady Lily ...	Mrs. Burnside ...	do. ...	N.Y.A.	2	6	26 5 29	273	6,789	5·67	384·90	18	Starbright's Sweet Duke of Glen Iris- 3017
Maggie 4th of Kurrawong ...	W. G. Burges ...	M.S. ...	Vol. 8	2	7	5 10 28	273	7,371	5·01	369·88	27	Premier of Kurrawong- 1212
Minnamurra Judith	Misses Giblet and Johnston	Guernsey...	1867	2	7	5 5 29	273	5,199	6·04	313·99	13	Judge of Wollongbar—184
Brookvale Noble Girl ...	G. F. Coombs ...	Jersey ...	N.Y.A.	2	11	21 7 29	273	6,357	4·74	301·76	4	Noble Lad of Roelands- 3707
Wooroloo Daisy 1st	Sanatorium Farm	M.S. ...	Vol. 8	2	6	30-5-29	273	6,979	3·98	278·31	21½	Commercial of Blackheath—2001
Minnamurra Urvicto	Messrs. Giblett and Johnston	Guernsey ...	1597	2	9	12 5 29	273	5,818	4·77	277·87	14½	Minnamurra Golden Lad—402
Denmark Rosa 2nd	Dept. of Agriculture	do. ...	1793	2	6	9 8 29	273	5,196	5·28	274·33	12	Rose Chief of Wollongbar—130
Colleen 3rd of Garden Hill ...	W. Padbury ...	Jersey ...	N.Y.A.	2	10	30-1-29	273	4,359	3·78	252·24	13	Cream Socks of Glen Iris—1410
Minnamurra Fairy Queen ...	Messrs. Giblett and Johnston	Guernsey...	1592	2	10	8 4 29	273	5,134	4·77	244·87	16½	Minnamurra Golden Lad—402
Muresk Lily	Muresk Agricultural College	do. ...	N.Y.A.	2	6	26-8-29	273	4,945	4·78	236·50	13½	Triumph of Wollongbar—513
Sunlight of Wooroloo ...	Wooroloo Sanatorium	M.S. ...	Vol. 8	2	7	24 8-29	273	5,098	4·61	235·20	14½	Commercial of Blackheath—2001
Koojan Jess	Dept. of Agriculture	Guernsey...	1570	2	11	4-7-29	273	4,044	5·29	214·14	8	Koojan Golden Governor—595

Blanche 5th of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2	7	13 7-29	273	5,442	3·80	207·23	14	Telyarup Prince of Claremont—2352
Grantara Cecilia	H. G. Walton ...	Red Poll ...	2191A	2	7	5-6-29	273	4,531	4·44	201·55	5½	Grantara Lysander 496A
Clara 3rd of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2	7	31-3-29	273	4,600	3·99	183·65	13½	Telyarup Prince of Claremont—2352
Grantara Cynthia	H. G. Walton ...	Red Poll ...	2192A	2	9	30-5-29	273	4,542	3·87	175·91	9	Grantara Lysander—496A
Fancy of Claremont	Hospital for Insane	M.S. ...	15065	2	7	13-10-29	210	4,185	3·53	147·72	9½	Telyarup Prince of Claremont—2352

HEIFERS UNDER 2½ YEARS—STANDARD 200 LBS. BUTTER FAT.

Kitty 8th of Kurrawong ...	W. G. Burges ...	M.S. ...	N.Y.A.	2	3	3-11-28	273	7,612	4·92	374·97	22½	Premier of Kurrawong—1212
Koojan Bluebell	A. W. Wilson ...	Guernsey...	1674	2	5	8-1-29	273	7,218	5·10	368·69	26	Robin of Nundorah—417
Koojan Thelma	A. W. Padbury ...	do. ...	...	2	4	18-9-29	273	6,549	5·46	357·80	18	do. do.
Koojan Ida	do.	do. ...	1900	2	5	1-7-29	273	6,306	5·37	339·12	22	do. do.
Moorlands Romany Maid 2nd	P. Rose	Jersey ...	N.Y.A.	2	4	6-6-29	273	5,236	5·54	290·18	10½	Colonel of Melrose—4015
Pentland Blossom 5th of Claremont	Hospital for Insane	M.S. ...	15070	2	4	14-9-29	273	6,967	3·98	277·65	17½	Telyarup Prince of Claremont—2352
Moorlands Bebe	P. Rose	Jersey ...	N.Y.A.	2	1	16-5-29	273	6,276	4·32	271·02	12	Grafter of Melrose—3560
Molly 5th of Claremont ...	Hospital for Insane	M.S. ...	N.Y.A.	2	1	10-5-29	273	6,667	3·94	262·62	22½	Searchlight of Sunnyvale
Moorlands Barbe	P. Rose	Jersey ...	N.Y.A.	2	0	14-5-29	273	5,523	4·7	259·87	11	Colonel of Melrose—4015
Carnation 2nd of Minnathorpe	E. McManus ...	M.S. ...	N.Y.A.	2	3	4-8-29	223	5,904	4·37	258·22	18	Collier of Darbalara
Redwings 2nd of Wooroloo ...	Sanatorium Farm	do. ...	N.Y.A.	2	5	24-6-29	273	7,031	3·61	254·14	20½	Commerical of Blackheath—2001
Minnamurra Joyce	Giblett and Johnston	Guernsey...	1866	2	5	9 4-29	273	6,408	3·96	254·02	21	Minnamurra Golden Lad—402
Colmyn's Lady	C. H. Ironmonger	Jersey ...	23667	1	10	14 11-28	273	5,302	4·73	249·38	17½	Milord of Roelands
Muresk Buttercup	Muresk Agricultural College	Guernsey...	N.Y.A.	2	2	26 6 29	273	4,987	4·92	245·55	12½	Triumph of Wollongbar—513
Gem of Wooroloo	Sanatorium Farm	M.S. ...	N.Y.A.	2	5	10 2 29	273	6,123	3·98	244·23	21	Commerical of Blackheath—2001
Moorlands Pearl	P. Rose	Jersey ...	N.Y.A.	2	3	16 5 29	273	4,545	5·28	240·40	10	Colonel of Melrose—4015
Moorlands Bridget	do.	do. ...	N.Y.A.	2	0	14-5-29	273	5,738	4·13	236·93	9½	do. do.
Muresk Carnation	Muresk Agricultural College	Guernsey...	N.Y.A.	2	2	12-7 29	273	4,851	4·83	234·49	12	Triumph of Wollongbar—513
Montrose Nora of Grass Vale	R. H. Rose ...	Jersey ...	N.Y.A.	1	10	15-5-29	273	4,048	5·48	221·99	9½	Montrose East of Glen Iris—4140
Karridale Nancy	A. W. Wilson ...	Guernsey...	1980	1	11	8 6 29	273	5,754	3·83	220·58	13	Minnamurra Oliver Twist—528
Biddy 8th of Claremont ...	Hospital for Insane	M.S. ...	N.Y.A.	2	0	21-8 29	273	5,538	3·87	214·71	16	Telyarup Prince of Claremont
Colmynis Topaz Girl	C. H. Ironmonger	Jersey ...	N.Y.A.	1	4	12 11-28	273	3,670	5·84	214·34	13½	Milord of Roelands
May 2nd of Wooroloo ...	Sanatorium Farm	M.S. ...	N.Y.A.	2	1	3 2 29	273	5,361	3·93	211·12	17	Commercial of Blackheath—2001
Colmynis Princess	C. H. Ironmonger	Jersey ...	N.Y.A.	2	4	7 9 29	273	4,512	4·66	210·41	14	Prince Marinora of Grass Vale—4582
Star of Claremont	Hospital for Insane	M.S. ...	N.Y.A.	2	3	1 8-29	273	5,512	3·80	209·90	12½	Telyarup Prince of Claremont—2352
Garden Hill Ice Cream 2nd ...	W. Padbury ...	Jersey ...	N.Y.A.	2	4	30-4-29	273	3,645	5·71	209·38	10	Cream Socks of Glen Iris
Lucy 3rd of Claremont ...	Hospital for Insane	M.S. ...	N.Y.A.	2	1	24-7-29	273	4,977	4·14	206·22	14	Telyarup Prince of Claremont—2352
Minnamurra Iona	Giblett and Johnston	Guernsey...	1863	2	3	6-2-29	273	3,496	5·82	203·48	10½	Judge of Wollongbar—184
Pentland Blossom 6th of Claremont	Hospital for Insane	M.S. ...	N.Y.A.	2	2	19-8-29	273	4,867	4·16	202·57	12½	Telyarup Prince of Claremont—2352
Whitby Maid 6th of Claremont	do. do.	do. ...	N.Y.A.	1	10	8-5-29	273	5,341	3·59	191·84	15½	Searchlight of Sunnyvale
Rachel 4th of Claremont ...	do. do	do. ...	N.Y.A.	2	0	7-5-29	273	5,821	3·06	178·59	15½	do. do.
Grantara Ida	H. G. Walton ...	Red Poll ...	2195A	2	3	9-6-29	273	3,522	4·24	149·62	4	Grantara Lysander—496A
Melba of Wangara	H. T. Dunkley ...	M.S. ...	N.Y.A.	2	2	30-1-29	273	3,207	4·08	131·07	9	Victor of Darbalara—2384

CENTENARY CERTIFICATES FOR SHEEP FARMERS.

The Director of Agriculture, Mr. G. L. Sutton, has made available the list of farmers, as supplied by the adjudicator, Mr. H. McCallum, Sheep and Wool Inspector, who have been awarded "Centenary Production Certificates" for wool produced by them during 1929, the Centenary Year.

Three certificates were awarded to farmers with flocks of at least 200 sheep, as under:—

Award of Merit to those whose clip averaged 12s. 6d. per head.

Award of Distinction to those whose clip averaged 15s. per head.

Award of Special Distinction to those whose clip averaged 20s. per head.

The values were based on Bradford Tops at 48d. at the time of sale, an allowance of 25 per cent. being made on the value of the wool from each ewe rearing a lamb for the season:—

	Adjusted Value per head. s. d.
Special Distinction—	
Gerald H. York, "Fairfields," Tammin	20 0
Richard F. Thackray, "Glen Rowan," Culham	20 5
Eric W. Shenton, "Nuytsia," Quairading	21 1
Alan Murray, "Quonyonbing," Tinkurrin	21 3
John F. Harvey, "Ormidale," Lake Grace	22 6
E. M., K., and C. Allen, "Cairin," Bruce Rock	24 10
Fredk. W. Gibbs, Dinninup	23 8
Douglas Wilson, Woodanilling	20 1
Emil B. Hettner, Cherry Tree Pool, Katanning	23 9
Wise, H. J., "Wayville," Katanning	21 3
Hugh J. Haggerty, Erikin	25 10
O. P. Richardson (Estate of), "Mianelup," Gnowangerup	20 3
Alex Ball, "Rylestone," Katanning	21 1
Distinction—	
Charles Snell, "Longfarm," Nangeenan	16 6
Stephen P. Shaddick, "Mourambine," E. Pingelly	18 10
John Read, "Tokyngton," Coorow	15 7
Edgar Richardson, Jam Creek, Broomehill	19 4
Robert E. Jones, "Bellalie," Ejanding	15 9
Rollo M. Inverarity, "Booyah Park," Kellerberrin	17 3
David W. Hannan, "Mount Pleasant," Bencubbin	17 2
Arthur A. Groves, "Springhill," Tambellup	15 2
Clarence W. Fleay, "Golden Valley," Broomehill	17 11
Stanley Davis, "Condinup," Dinninup	15 10
Leonard B. Bolton, "Burlington," Namban	18 11
State Experiment Farm, Merredin	16 9
George Uppill, "Nuppin," Tammin	15 0
Frank R. Twine, "Newgain," Toodyay	16 11
Phillip J. Toll, "Jaloran," Wagin	17 5
Henry H. Kramer, "Oakbank," Wagin	17 1
Charles H. Cardwell, Noman's Lake	16 5
J. W. Cohen and V. E. Gibbs, "Wildwood," Moulyinning	16 8
Henry T. Salathiel, "Fairfields," Yealering	15 1
Thomas Skinner, "Athelstone," Carbarup	15 4

	Adjusted Value per head. s. d.
Distinction—	
Charles Mott, "Glenalbyn," Moulyinning	18 8
Joseph O'Neill, Tambellup	15 4
Ernest A. Mouritz, "Red Hill," Gnowangerup	17 6
Leslie G. Micheal, "Hillcotte," Round Hill	19 8
Hosken Bros., Dorakin, Wickepin	15 9
David G. Sloan, "Oaklands," Williams	15 4
State Experiment Farm, Chapman	16 3
Ernest W. Watts, "Westwood," Wandering	19 7
Bertram J. Forbes, "White Rocks," Bullock Hills	16 4
Arthur J. Hunt, "White Gums," Mount Barker	16 9
James Boucher, "Gumbower," Dumbleyung	19 2
Staniforth Smith, "Culicup," Kulikup	17 1
Edward W. Rosenberg, "Sheoak Top," Wagin	15 8
Certificate of Merit—	
Sydney A. Williss, "Eatondale," Mt. Barker	14 5
Robinson Bros., "Woodillon," Babakin	13 9
Roland A. Ritson, "Daneholm," Boyup Brook	14 4
Mallet & Bielby, Meenaar	14 3
John A. Knight, "Rocklands," Corrigin	12 3
John D. Hammond, "Cuttening," Kellerberrin	13 3
Harry J. Broome, "Whitfield," Coolakin	14 10
Minchin Bros., "Maisemore," Toodyay	12 9
Cedric W. Sainsbury, "Windy Ridge," Lomos	12 6
Fordham Bros., "Glendale," Calcarra	13 9
Alwyn W. Wagner, "Tottenup," Boyup Brook	14 0
Hughes Bros., "Strathmore," Minnivale	13 10
Martin Sugg, "Dingo Dell," Kukerin	13 0
Samuel H. Rudduck, "El Cala," Coorow	14 1
Samuel B. Rudduck, "Koobabbie," Coorow	14 9
John A. Brown, "Raith," Yandanooka	14 1
Jacob McDougall, "Allendale," Datatine	14 8
Leslie M. Baikie, "Telpyn," Quairading	13 11
C. & A. H. Smith, "Sunnyside," Bruce Rock	14 6
Thomas P. Scanlon, "Hilltop," Wagin	13 3
James Curnow, "The Angle," Bulading	12 10
Alfred J. Abbott, "Carmoning," Wedgecarrup	12 8
G. F. Marsh, "Gelobine," West Brookton	13 3
Harold E. Jeffries, "Campsie," Wagin	12 8
Milo R. Keally, Woodanilling	14 9
William J. Wunnenberg, "Range View," Darkan	14 3
William J. Henderson, "Glendale," Scott's Brook	13 3
Colin H. Norman, "Romilly," West Dale	13 6
Sarah A. Gibbs (Mrs.), Boolading, Darkan	14 10
W. & E. M. Marsh, "Marshalands," Pingelly	14 3
Glen V. Mitchell, "Bickley Park," Donnybrook	14 0
Bruce H. Hobart, "Fairview," Coyrecup	13 5
John P. Ramm, "Rock Hill," Woodanilling	14 0
J. MacCallum Smith, "Homebush Stud Farm," Cookernup	14 8

Awards not yet available (Clips awaiting sale)—

Russell G. Bennett, "Goodworth," Dumbleyung.
Tayler Bros., "Wandin Hill," Yuna.
Bertram Torrie, "Raith," Kulikup.

HORTICULTURAL NOTES.

PRODUCTION AND EXPORT.

GEO W. WICKENS, Superintendent of Horticulture.

Owing to a light apple crop the quantity of fruit shipped from Western Australia for year ending 30th June, 1930, was less even than in the previous light season of 1927-28, and in fact was the smallest since the season of 1920-21.

The principal kinds of fruit exported from Western Australia are apples, grapes, pears and oranges, ranging in quantities in that order, but apples comprise by far the major portion of the total shipments, and a light apple crop means a small export, as shown by the following table:—

Year.	Apple Crop.	Total quantity all kinds of fruit exported.
	cases.	cases.
1927	901,464	564,412
1928	409,058	235,498
1929	1,122,173	737,676
1930	380,000 estimated) ...	227,820

The area under all kinds of fruit and production for season 1928-29 (latest figures available) and the quantities exported during the year ended 30th June, 1930, are as follow:—

FRUIT PRODUCTION AND ACREAGE FOR SEASON 1928-29.

Kinds of Fruit.	Area.			Yield.
	Unproductive.	Productive.	Total.	
	acres.	acres.	acres.	bushels.
Oranges	472	2,459	2,931	226,681
Mandarins	19	166	185	16,373
Lemons	62	466	528	58,108
Other Citrus Fruits	8	18	26	3,823
Apples	2,899	7,569	10,468	1,122,713
Pears	146	941	1,087	98,544
Peaches	161	622	783	42,348
Apricots	171	533	704	33,073
Nectarines	54	148	202	9,546
Plums	265	687	952	51,694
Quinces	25	88	113	8,438
Figs	73	311	384	34,919
Bananas and Plantains	8	11	19	563
				Value.
All other Fruit Trees	77	225	302	£6,081
				Quarts
Strawberries	...	37	37	41,812
				Value
All other small fruits	...	14	14	£218
	4,440	14,295	18,735	...
Grape Vines.				
				cwts.
Table Grapes	...	1,037	...	56,226
Wine Grapes	...	1,210	...	47,569
Drying Grapes	...	2,324	...	158,261
Grape Vines...	372	...	...	...
	372	4,571	4,943	262,056

FRUIT DRIED FROM THE 1928-29 SEASON'S CROP.

Raisins, Table Clusters.	Lexias.	Sultanas.	Currants.	Total.
cwts.	cwts.	cwts.	cwts.	cwts.
342	7,782	3,722	25,810	37,656

EXPORT OF FRESH FRUIT FROM WESTERN AUSTRALIA FOR YEAR ENDING 30TH JUNE, 1930.

Destination.	Apples.	Pears.	Grapes.	Nectarines.	Peaches.	Plums.	Passion Fruit.	Oranges.	Lemons.	Tomatoes.	Quinces.	Grape Fruit.
	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.
London ...	21,667	13,781½	11,168	3	...	...	...	402	...	...	9	13
Hull	1,193	...	150	...	...	...	...	...	...	...	...	...
Southampton ...	2,049	...	100	...	...	...	...	...	...	...	...	...
Liverpool ...	2,242	80	82	...	...	...	...	...	...	...	...	...
Colombo ...	5,664	...	19,785	...	...	...	...	310	...	...	...	...
Durban ...	200	...	...	...	...	...	...	...	...	...	...	...
New Zealand ...	...	...	...	...	...	...	...	260	...	...	...	...
Hong Kong ...	...	...	...	...	...	...	...	50	...	...	...	...
Dunkirk ...	20	...	...	...	...	...	...	...	...	...	...	...
Hamburg ...	59,182½	7,583½	201	...	...	...	...	...	...	...	7	...
Rotterdam ...	249	...	50	...	...	...	...	...	...	...	...	...
Stockholm ...	39,054	265	...	...	...	...	...	...	...	...	...	...
Bombay ...	554	...	215	...	...	...	...	...	...	...	...	...
Port Said ...	6,553	...	83	...	...	...	...	...	...	...	...	...
Rangoon ...	300	...	300	...	...	...	...	...	...	...	...	...
Batavia ...	2,683	237	2,383	...	20	87	...	341	10	...	...	...
Sourabaya ...	3,410	100	1,942	...	24	81	...	124	...	...	5	...
Singapore ...	14,194	444½	6,593	17	197	210	2	793	67	31	...	...
Total ...	159,214½	22,491½	43,052	20	241	378	2	2,280	77	31	21	13

Grand Total ... ... 227,820¾ cases.

COSTS INCURRED IN CO-OPERATIVE EFFORT TO CONTROL FRUIT FLY.

CHAS. SIMMONS, Orchard Inspector.

Following on the account of the operations of Community Baiting carried out by the Gosnells District Association, published in the September issue of this Journal for 1929, the following extracts from the Balance Sheets adopted by the Gosnells District Growers' Association, and the record books of the men who baited the orchards may be of use and interest to other circles of fruitgrowers.

The particulars published in the "Journal of Agriculture" last year show how the scheme is worked, particularly with regard to the manner of keeping records of the work, the supervision of the men employed and the number of trees that a man travelling from orchard to orchard can deal with in a day's work. The present article deals more with the cost of baiting, leaving the fruitgrower to judge as to the merits of the scheme by comparison with his individual costs and results.

In 1927-28 (Maddington-Gosnells area) during 16 rounds—29,086 trees were foliage baited at a cost of £76 5s. 9d. or .595 of a penny per tree each time the tree was foliage baited.

In 1928-29 (Maddington, Gosnells and Kelmscott area) during 18 rounds 126,918 trees were foliage baited at a cost of £201 10s. 3d. or .4 of a penny per tree each time the tree was foliage baited.

In 1929-30 (Maddington, Gosnells, Kelmscott and Armadale area) 238,197 trees were foliage baited at a cost of £377 19s. 1d. or .38 of a penny per tree each time the tree was foliage baited.

In order to make clear what is meant by the cost of .38 of a penny per tree each time the tree was foliage baited it is necessary to explain that each tree must be foliage baited every seventh day during the period commencing when the fruit is half grown until it has ripened. Thus, some trees may be foliage baited say 8 times, whilst others may require to be baited 20 times or even more. The cost given, .38 of a penny per tree, does not mean, therefore, the average cost of foliage baiting one tree throughout the season, but the average cost of one "baiting" per tree each time the trees were foliage baited on the round.

There was a considerable difference in the number of times it was necessary to foliage bait each tree. This fact is brought out by the following figures which have been compiled from the record book carried by the operator:—

Orchard.	No. of trees.	Number of foliage baitings during season.	Visits.
No. 1	1,000	8,236	22
2	1,000	5,229	23
3	750	2,558	22
4	700	6,676	24
5	650	5,625	24
6	650	2,647	23
7	150	784	23
8	100	681	24
9	50	356	24
10	25	272	23
11	25	468	24
12	12	137	24

It will be seen from the above that there were 12 orchards containing 5,112 trees, and that the number of "foliage baitings" given during the season amounted to 33,669 so that on the average each tree received 6.586 baitings. This, however, does not represent the true position for there was a considerable variation between orchards. This is brought out by the following instances. In one orchard of 1,000 trees the number of baitings was 8,236 or 8 per tree, whilst in another orchard with the same number of trees the number of baitings was 5,229 or 5 per tree. Two other comparable instances in the case of smaller orchards are even more striking—in the case of 25 trees, during the 24 visits paid by the operator during the season (18th October, 1929, to 18th April, 1930) there were 468 batings, or an average of nearly 19 baitings per tree; in the other orchard, also of 25 trees, there were 272 baitings, or on the average nearly 11 per tree.

The explanation of the disparity in the number of trees foliage baited in orchards of equal area is that in the orchards of mixed citrus, stone and pip fruits, together with figs, persimmons, etc., a greater proportion of the trees require to be treated than in an orchard almost wholly planted to one variety.

Following on the success in Fruit Fly control by Community foliage baiting in the Gosnells, Maddington and Kelmscott areas, the Armadale Fruitgrowers' Association requested that the scheme be extended to their district. On making a canvas of the town of Armadale, and the adjacent orchards, the owners of both commercial and non-commercial properties, readily acquiesced, and the result was that out of 92 small and large orchards within a radius of two miles of the Post Office, 91 joined up. The season's work was—

ARMADALE, 1929-30.

Area—91 orchards within two miles of Armadale Post Office.

Visits—24—one man employed 113 days.

Total number of trees foliage baited—91,928.

Average number of trees foliage baited per visit—3,830.

Average number of orchards visited per round—86.

Total cost—£147 14s. 8d., being—

Labour	£102 1 6
Bait	45 13 2

Average cost per tree per foliage baiting—.386 of a penny, being—

Labour	.267 pence
Bait	.119 pence

One gallon of concentrated bait was used to every 713 trees. 1,032 dilute gallons of bait were used on 91,928 trees, or 1 gallon to every 89 trees.

For the purpose of ascertaining the cost of foliage baiting the different varieties of fruit trees, the season from October, 1929, to April, 1930, was divided into three sections—

FIRST SECTION—18th October to 18th December—8 weeks—8 visits.

No. of foliage baitings applied	32,512
Orchards visited	705
Gallons of bait used	48
Days worked	43
Wages	£38 14 0
Cost of bait	19 4 0
Total Cost	£57 18 0
Cost per foliage baiting	.42 of a penny
Cost for each tree from 18th October to 18th December	3.36 pence

The trees foliage baited during this period were late Valencia oranges, lemons, early peaches, loquats and early apricots.

SECOND SECTION—18th December to 18th February—9 weeks—8 visits.

No. of foliage baitings applied	35,250
Orchards visited	721
Gallons of bait used	48
Days worked	40
Wages	£36 0 0
Cost of bait	19 4 0
Total Cost	£55 4 0
Cost per foliage baiting	.376 of a penny
Cost of foliage baiting each tree from 18th December to 18th February	3.008 pence

The trees foliage baited during this period were mid-season peaches, apricots, Japanese plums, Bartlett pears, lemons and early figs.

THIRD SECTION—18th February to 18th April—8 weeks—8 visits.

No. of foliage baitings applied	24,166
Orchards visited	686
Gallons of bait used	21
Days worked	30
Wages	£27 0 0
Cost of bait	8 12 8
Total Cost	£35 12 8
Cost per foliage baiting	.353 of a penny
Cost of foliage baiting each tree from 18th February to 18th April	2.82 pence

The trees foliage baited during this period were late peaches, pears, apples, persimmons, plums, navel oranges and figs.

The clean crop of fruit at Armadale is the justification of the expense incurred. The commercial growers at Armadale state that for the first time for many years they were able to market their midseason and late fruits free from fruit fly, and in some instances, the first time for years, were able to sell any of the late fruits. Community foliage baiting is not wholly responsible for that improvement: the picking up of fallen fruit was also very well attended to, and the very hot weather during the early part of the summer probably checked the usual rapid increase of fruit fly.

During February when Elberta peaches, late nectarines and Bartlett pears were being picked, it required a very thorough search to find any infected fruits, and it was well into March before any increase of fruit fly was noticeable.

The fruitgrowers of Armadale are best able to testify to the success of the scheme in their district, both with regard to economy and control of the pest, and they have expressed themselves as entirely satisfied.

AN OUTBREAK OF "DOWNY MILDEW" (so-called "BLUE MOULD") OF TOBACCO IN WESTERN AUSTRALIA.

H. A. PITTMAN, B.Sc.Agr.,
Plant Pathologist.

The disease known as "downy mildew," or, more frequently, "blue mould" of tobacco is the most disastrous disease with which the Australian tobacco-grower has to contend. The extremely serious nature of the trouble under favourable conditions may perhaps be best realised from the following quotations.

In the "Report from the Select Committee on the Tobacco-growing Industry in Australia," 1929-30, (8), occurs the statement: "The growers have hitherto proved unable to deal with the blue mould disease, which in may cases wipes out the tobacco of a whole district two out of three seasons." Adam (1), writing in the Victorian Journal of Agriculture for July, 1925, stated, "Frequently a tobacco seed-bed, containing thousands of plants in a condition ready for planting out, is ravaged to such an extent that every plant is affected. Growers, in the past, by cultivating a large number of seed-beds in different parts, especially in the hills, sought to avoid disease in some beds, and usually from these sufficient plants could be obtained for planting-out purposes. A more serious problem has arisen lately in that the disease is not confined to the seed-bed, and quite large areas of planted-out tobacco in various stages of maturity have been ruined by it."

Prior to the occurrence of the present outbreak in the South-west of this State the disease had been reported from all the mainland States of the Commonwealth with the exception of Western Australia. On the 14th August, 1930, tobacco seedlings copiously laden with the fruiting bodies of the "downy mildew" (*Peronospora sp.*) were received from Manjimup, this constituting the first record of the disease for this State. A hurried visit to the district by Mr. A. R. C. Clifton, who is in charge of the tobacco investigations in this State, and the writer, revealed that the disease had apparently been present in a mild form unrecognised for several years. A considerable number of very forward plants were affected in the earliest sown seed-beds, infection having presumably taken place from some diseased tobacco suckers which were found over-wintering in a field nearby. In view of the recently-reported proof of seed-transmission by Angell (2), it is not difficult to realise how infection may have been brought to this State in the first place. Steps are being taken to have the importation of tobacco seed to this State prohibited except for Departmental purposes, and further to prevent the sale or distribution of locally-grown tobacco seed within the State, unless it has been first disinfected in absolute alcohol by officers of this Department to destroy any infection possibly being carried by the seed. The local tobacco-growing industry is still in a condition of extreme infancy and it is worth while taking any reasonable precautions, no matter how severe, to prevent if possible the widespread distribution of the disease within the State.

CHARACTERISTICS OF THE DISEASE.

As shown by Darnell-Smith (4), a tobacco seedling may be infected in the very earliest stages, *i.e.*, when it has not yet developed its first true leaves, but is still in the "cotyledon" or "seed leaf" condition. From that time onwards, right throughout its life, it may fall a prey to the disease whenever the weather condi-

tions become suitable to the development of the fungus and the plant happens to be in a susceptible condition.

In actual practice "downy mildew" or "blue mould" of tobacco is, in most instances, very largely a seed-bed disease, although—as shown above—it may at times cause very severe losses after the seedlings have been planted out. The causal fungus (*Peronospora sp.*) is a member of the rather primitive group of fungi known as the *Peronosporales,* to which also belongs *Phytophtora infestans,* the cause of "Irish Blight" of the potato. All these fungi require abundance of moisture for their best development, and so it is only under the abnormally moist atmospheric conditions of the seed-bed that the disease is likely to be of much consequence in Western Australia. The "downy mildew" of tobacco appears to require very similar conditions to those required by "Irish Blight" for its rapid and serious development, namely, warm, muggy conditions during the day and rather cold air temperatures at night, or fairly rapid alternations of muggy and cold weather. As, therefore, the climatic conditions in the South-western area of this State are only very occasionally favourable to "Irish Blight," it would seem reasonable to suppose the same would apply to "downy mildew" of tobacco once the seedlings had been planted out. If Western Australian growers can manage to get their seedlings through the seed-bed stage they should experience very little trouble with the disease in the field under normal climatic conditions.

SYMPTOMS SHOWN BY DISEASED PLANTS.

The most characteristic feature of affected plants is the development of a dense, white or greyish down on the *underneath* portions of the diseased leaves. This downy substance is really composed of the fruiting-branches of the fungus loaded with the microscopic lemon-shaped or oval seed-bodies or *spores.* Under the microscope the fruiting structures (*conidiophores*) bear a rather striking resemblance to a dead, but still standing, karri tree, the spores being produced singly at the extremities of the many-forked branches. Under a strong hand-lens the mildew appears like a mass of densely tangled whitish scrub (Fig. 1b.). (The appellation "blue mould" was given to the disease on account of a very faint *violet* tint occasionally distinguishable in the fungal down, but the name does not seem to me at all appropriate, as, so far as my observation goes, the *least* conspicuous feature of the fungus is its supposed blueness. The name has the further disadvantage of immediately calling to mind the well-known "blue moulds" of fruit and other edible products commonly caused by species of *Penicillium,* to which the *Peronospora* of tobacco has only a distant relationship.)

Looked at from *above,* affected leaves show no evidence of the "downy mildew" itself, but the diseased plants can usually be picked out by the occurrence of irregular yellow blotches on the leaves, or by the drying-out and shrivelling-up of the diseased areas (Fig. 1a). Affected leaves are often a more or less uniform pale yellow in colour when looked at from above. Under conditions very favourable to the fungus the whole plant may soon wither up and completely collapse, but, should unfavourable conditions for the fungus ensue before this occurs, the plant may recover more or less completely until conditions are once again favourable for the further development of the parasite, when the disease may make further headway until perhaps checked yet again by unfavourable conditions. Darnell-Smith (4) records that a plant once infected is always a potential source of infection, "for example, an infected plant kept in an isolated bush house produced a crop of spores in November, another crop in the following March, and a

third crop in the following November." On the occurrence of the present outbreak it was found that infection of the seedlings had almost certainly been brought about by the blowing of *conidia* (spores) from over-wintering diseased plants.

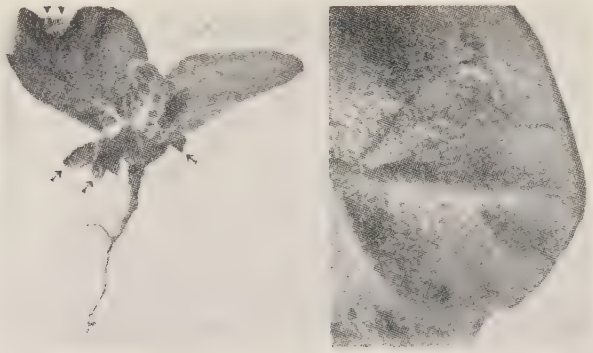

Fig 1. *a.* (*left*). A young tobacco plant infected with "downy mildew" ("blue mould"). Note the shrivelling of the leaves indicated by the arrows.

b. (*right*). Portion of the underneath side of a young leaf infected with "downy mildew" ("blue mould"). Note the whitish, downy, growth of the fruiting-bodies of the causal fungus, *Peronospora sp.* (Magnified). *After N.S. Wales Dept. of Agriculture.*

These old plants on being examined were found in a number of cases to have several dead brown areas on a number of the bottom leaves. On the underneath surfaces of the dead tissues were found large numbers of the typical *Peronospora* conidiophores.

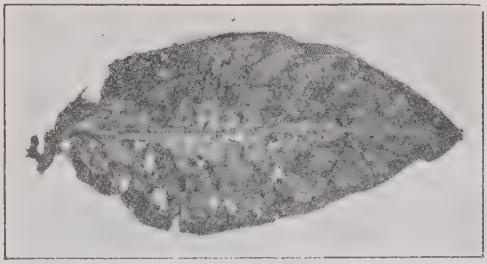

Fig. 2.—Adult tobacco leaf showing holes in places previously attacked by "downy mildew" ("blue mould") due to *Peronospora sp.* *After N. S. Wales Dept. of Agriculture.*

In addition to occurring on the cultivated tobacco, "downy mildew" or "blue mould" has been also recorded on a species of native tobacco (*Nicotiana suaveolens*) (1, 4). Darnell-Smith (4) reports that a *Nicotiana* closely related to *N. suaveolens* obtained from Lord Howe Island was found to be liable to infection. *Solanum pseudo-capsicum* (Jerusalem Cherry) and *Solanum sodomaeum* (Apple of Sodom) gave negative results (4).

LIFE HISTORY OF THE FUNGUS.

In spite of the fact that "blue mould" has long been a serious disease in the Eastern States and that numerous short articles on the disease have appeared from time to time in the various Agricultural Journals and elsewhere, there has apparently never been any very intensive laboratory study made of the disease, and so there are many points on which our knowledge is surprisingly meagre.

For instance, it is known that the fungus responsible for the disease may produce thick-walled resting spores in the dead tissues known as *oospores* (1), which may retain their vitality for long periods, but in what numbers they are normally produced or just how important may be their role in nature in carrying the disease over from season to season is unknown.

Another rather surprising feature is that there is very little *exact* data as to the particular climatic conditions under which epidemics of the disease occur. In this connection Darnell-Smith (5) states, "It makes its appearance particularly when the rainfall is excessive" and "a particular relationship must exist between the weather, the plant attacked, and the fungus before the latter can establish itself and spread with rapidity." Just what this relationship is, is not stated. Adam (1) in 1925 wrote, "There is a close connection between climatic conditions and the incidence of 'blue mould' disease. Data in respect of temperature, humidity, and rainfall have been collected at Wahgunyah Experiment Farm and at Buffalo River. . . . . This data, with notes on the disease obtained from year to year, will acquire more interest with the passage of time, but nothing useful can be gained from their presentation here." Mr. Temple A. J. Smith, Tobacco Expert of the Victorian Department of Agriculture, writing on "blue mould" in 1911, stated: "It is worse in or after wet seasons when the first warmth of spring is felt. (Rusty seasons for wheat are generally bad for blue mould.)" (6).

Conidia of the "blue mould" fungus apparently only remain viable for a few days. Adam (1), for example, states, "From its structure the oospore, or resting spore, is able to retain its vitality for quite long periods. In this regard it is distinct from the short-lived conidia, or summer spores, previously mentioned as constituting part of the familiar violet downy patches characteristic of the disease."

In connection with the phenomena of *infection* Darnell-Smith (4) writes—"It has been observed (in numerous infection experiments carried out with the spores of blue mould):—

1. That the spores germinate, under suitable conditions, within twenty-four hours.
2. That they produce a strong germ tube which enters by the leaf pores.
3. That, having entered the leaf, a large number of hyphae are produced in the tissues.
4. That, within eight or nine days, a fresh crop of spores may be produced from the infected leaf.
5. That a tobacco plant in its very youngest stages may become infected with 'blue mould.'"

Angell (3) implies in the following statement that under normal conditions the conidia live, at the most, only a few days, " . . . we have found that . . . under certain conditions of temperature and humidity the detached conidia of the blue mould fungus may remain viable for, and germinate after, 54 hours or more . . . ."

The same writer further states (3) that in certain experiments "the usual period of seven days required for infection was in this case, as well as in others which have come under our notice, reduced to four days, this being apparently due to the very favourable conditions of temperature (23deg. C.) (equalling 73.4deg. F.) and humidity under which the seedlings were kept and more especially perhaps to their extreme susceptibility at that age." "The seedlings used had germinated five to seven days before the experiment was carried out . . . ."

It would seem then that the optimum temperature for infection by the "downy mildew" lies somewhere in the vicinity of 73deg. F.

On the other hand, in "The Farmers' Handbook," 5th edition, published in 1929 by the New South Wales Department of Agriculture, it is stated, "Experiments conducted by the department during the last few years indicate that if the temperature of the seedlings is not allowed to fall below 45deg. F. and the surrounding air is not allowed to become humid, blue mould does not make its appearance."

We may conclude then that the conditions favouring the most rapid development and spread of the "downy mildew" or "blue mould" disease of tobacco are warm, muggy conditions during the day with low temperatures at night, or else warm, muggy periods alternating with cold ones. These conditions are similar to those required for epidemics of "Irish blight" in potatoes and various other "downy mildew" diseases of plants.

CONTROL MEASURES.

Determined efforts have been made to wipe out the "downy mildew" or "blue mould" fungus at the site of the present outbreak, but the success or otherwise of the measures taken can only become obvious as time goes on. In the event of it proving impossible to completely eradicate the fungus, growers will have to make rigorous efforts to keep the disease to the lowest possible limits, or, in other words, to "control" it.

In this connection no single measure can be relied on for success. Control of such a serious pest as the "blue mould" can only be achieved by the intelligent combination of a series of interdependent practices. These may be stated as follows:—

I. At the conclusion of the harvesting operations for the season, *i.e.*, when all the seed or leaf has been gathered, every tobacco plant on the property should be destroyed, in order to prevent carrying the fungus over from year to year on over-wintering plants. The best method of destruction would be to pull up the remains of the plants by the roots and burn them, but, if the same field is not to be used again for several years for tobacco-growing, there would be no objection to ploughing the plants under, provided that a mouldboard plough which will completely bury the tissues is used and that any suckers which may happen to grow up are systematically destroyed as soon as noticeable above the ground. Tobacco growers should regard tobacco plants growing on their properties at any other times than when being deliberately grown for seed or leaf as their worst possible enemies, from the point of view of insect and disease dissemination.

II. If possible, tobacco should not be grown more frequently than, say, once in three years on the same paddocks, as the fungus, in the resting-spore (*oospore*) stage, can apparently remain alive in the soil for a long period.

III. All seed sown should be treated before sowing in absolute alcohol for five minutes to destroy any infection possibly being carried by the seed. *The department has undertaken to treat all tobacco seed at cost price and steps are being taken under the Plant Diseases Act, 1914-26, to have the sale or distribution of tobacco seed within the State prohibited, unless and until the seed has first been disinfected by officers of this department. Under the same Act steps are also being taken to have the importation of tobacco seed from other States or overseas prohibited except for departmental purposes.* Disinfection of the seed in absolute alcohol has recently been shown by Angell (2) to be very effective, and this treatment must be considered henceforth a routine practice in tobacco culture. (Departmental experiments have shown that the germination of the seed is not detrimentally affected by as long an immersion as six and one half minutes in absolute alcohol, if the seed is spread out thinly and dried on clean blotting paper, and by evaporation of the alcohol, as quickly as possible following treatment.)

IV. After the seedbeds have been completely made up ready for planting they should be *sterilized* by the use of steam at 100 lbs. pressure for half an hour by means of the "inverted pan" system, or by the use of a strong wood fire on the site of the seedbed for at least four hours, or by watering with formalin at the rate of one gallon of formalin to fifty gallons of water, using half to one and a half gallons of solution to every square foot of soil. If using the formalin method the glass frames, or linen or hessian covers, should be put on the beds for two days following treatment, then removed and the beds allowed to air for at least 10 days before sowing the seed. The glass frames or other covers for the beds should be steamed, or watered with, or dipped in, the formalin solution, at the same time as the seed-beds are being disinfected. When stirring the beds to let out the formalin fumes, after the first two days, or to make a suitable surface on the bed to receive the seed, at the completion of the treatment, use a rake or shovel previously sterilized with steam, fire or formalin.

V. Remembering that the "downy mildew" or "blue mould" is greatly encouraged by abundance of moisture, every precaution should be taken to keep the surface of the seed-bed as dry as possible after the seeds have germinated. Every effort should be made to reduce the surface waterings to an absolute minimum or even to eliminate them altogether. This may be done by making the soil very firm during the preparation of the seed-bed so that water will readily flow to the roots by capillarity, or by watering, as in the "Marks" system (8), from a trough running along the back of the seed-bed with perforated pipes at right angles carrying the water several inches below the surface of the soil. Another good method of watering is to have agricultural drain tiles placed upright at intervals through the seed-bed, so that the water may be poured down into the sub-surface layers of the bed without directly wetting the surface or the leaves of the seedlings. Seed-beds should have a pronounced slope from the back to the front and should be so built as to lie broadside-on to the morning sun. As soon as the seeds have germinated they could be lightly covered with sterilized white sand, and a little of the sterilized sand could be sprinkled on the bed from time to time as the seedlings grow older. The sand may be sterilized by heating in shallow tins in an oven for several hours, and it could then be stored in sterilized kerosene tins until required.

The glass frames, or the linen or hessian covers to the seed-beds, should be removed every bright, dry, sunny day so as to cause hardening-up of the seedlings and prevent the steamy conditions so favourable to the "downy mildew."

VI. If possible some source of heat should be provided for the seed-beds at night, and during cold days, so as to prevent the temperatures dropping below 45deg. F., as the development of the fruiting-bodies of the fungus (and conse-

quently its rapid spread) seems to be greatly favoured by low temperatures following warm, muggy conditions just previously. Some growers make use of a fire with a straight-through or return flue *beneath the bed* to keep up the temperatures, while others have used a kerosene or petrol lamp outside one end of the bed to heat a pipe running through the frames *above* the seedlings. This would seem to be the best type, as tending to lower the humidity of the air above the bed quite considerably, but care must be taken to see that the apparatus cannot get too hot. Moreover, if this method is used, the covers to the seed-beds must be erected considerably further above the surface of the beds than is common practice at the present time.

VII. Seed-beds should be made long and narrow and not short and broad. About a yard wide should be ample. This type of construction greatly facilitates the work of weeding, transplanting, etc., and there is not nearly so much chance of spreading infection mechanically during inspection of the seedlings.

VIII. Seedlings should be lightly dusted on the *underneath* sides of the leaves with a recognised copper carbonate-sulphur dust in the event of any infection developing. This can be fairly readily applied by the use of a "sulphur bellows" provided with a straight nozzle. The bellows should be held several inches above the seed-bed at the handles and pointed forward and slightly down, so that a cloud of dust will hit the earth at a very acute angle and in glancing off and rising will come in contact with the bottom sides of the leaves. Moderation must be used in the application of the dust, and care must be taken to remove the frames whenever the sunlight becomes very hot following the treatment, or considerable "sulphur scorching" of the foliage may result.

IX. Seed-beds should be planted as *late* as possible in the spring, as the lower the atmospheric humidity during the growth of the seedlings and following transplanting the less is the danger of loss from "downy mildew." Considerably more seedlings should be raised than are actually required for planting out, and a succession of sowings in different seed-beds at weekly or fortnightly intervals may be of considerable value in ensuring that some at least will come through to planting-out time unscathed.

X. In the event of "downy mildew" breaking out in the field the plants should be sprayed with Bordeaux Mixture 3-3-50 plus ½lb. calcium caseinate to every 50 gallons of spray, taking great care to see that the bottom sides of the leaves are thoroughly sprayed. (Preparation of Bordeaux Mixture was described on page 259 and subsequent pages of the June issue of the "Journal" for 1930.) Instead of spraying, the plants could be dusted with a recognised copper carbonate-sulphur or copper sulphate-lime dust, although after planting out spraying will be found more effective than dusting.

XI. Should any plants in the seed-beds become affected with "downy mildew," they, and the immediately-surrounding plants, should be destroyed before removing from the bed by watering with a little strong bluestone solution made up at the rate of 1 lb. to 1 gallon of water. After the plants are dead, or thoroughly wet with the bluestone on the bottom sides of the leaves, they should be removed and burned.

XII. All precautions should be taken to keep down insect pests, as these are very liable to carry infection into the bed from neighbouring farms or from plant to plant in the beds. Angell (3) has recently shown that the "potato moth" or "tobacco leaf miner" (*Phthorimaea operculella*, Zell.) can readily carry infection, and the same undoubtedly applies to other insects such as the Lucerne Flea (*Smynthurus viridis*, Linn.) or the Red-legged Earth Mite (*Penthaleus destructor*, Jack.), etc.

A space free of all vegetation should be left for several yards around the tobacco beds as this will act as a good break to the lucerne flea, mite, and other similar walking or hopping insects.

XIII. Growers should refrain from visiting other growers' seed-beds, as one careless human might conceivably carry considerably greater numbers of *spores*, and for much greater distances, than could many insects.

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CONTAGIOUS ABORTION IN CATTLE.

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The subject matter contained herein is prepared with the object of assisting those cattle owners whose dairy herds are affected with contagious abortion to control the disease and eliminate it from their herds with the least economic loss. The disease is not new to this State but when it occurs the income of the dairy farmer is materially reduced by a loss of milk, loss of the calf, and time lost is treating affected animals. However, all such loss may be reduced to a minimum if the disease is understood by the farmer who, with successful treatment, prevents its progress, and the consequent sterility which commonly follows in the untreated animal. If sterility is avoided the disease is not to be feared as second abortion is uncommon.

For the purpose as stated above I am going to deal with this disease and its common sequelæ, sterility, in a practical manner.

Abortion, by which is meant the birth of the calf at any stage of development prior to the natural period of gestation, may occur as the result of accidental incidence of external forces or may be due to contagion. I intend passing over the former as any farmer who experiences abortion in his herd should in all cases act for safety and treat such cases of contagion as described below.

Contagious Abortion.—This may be defined as a disease of the womb resulting in the premature expulsion of the fœtus. It is caused by a specific bacillus which gains access to the blood by the digestive tract, and which has a predilection for the pregnant womb, and the udder of the non-pregnant cow. It sets up an inflammation therein and the result is premature expulsion of the undeveloped calf at varying stages prior to normal gestation. The period when abortion most often occurs is between the 3rd and 7th month. The casual organisms or bacilli are always present in the "Cleansings" and the discharges which come away with the imperfectly mature calf (or slink) and afterbirth. They are also found in the fæces of young calves from affected mothers. The disease, therefore, is spread by this means, resulting in contamination of the pastures, etc.

Symptoms.—When abortion is about to occur in a cow far gone in calf no symptoms sufficient to attract attention are, as a rule, exhibited. Occasionally evidence of uneasiness and attempts to apparently prepare for calving may be observed, but generally the event occurs with no premonition to the owner. However, after parturition the udder becomes swollen, there is relaxing of the tail muscles and a discharge is noticed issuing from the vulva. Smearing of the buttocks and the tail with a discharge is a common observation.

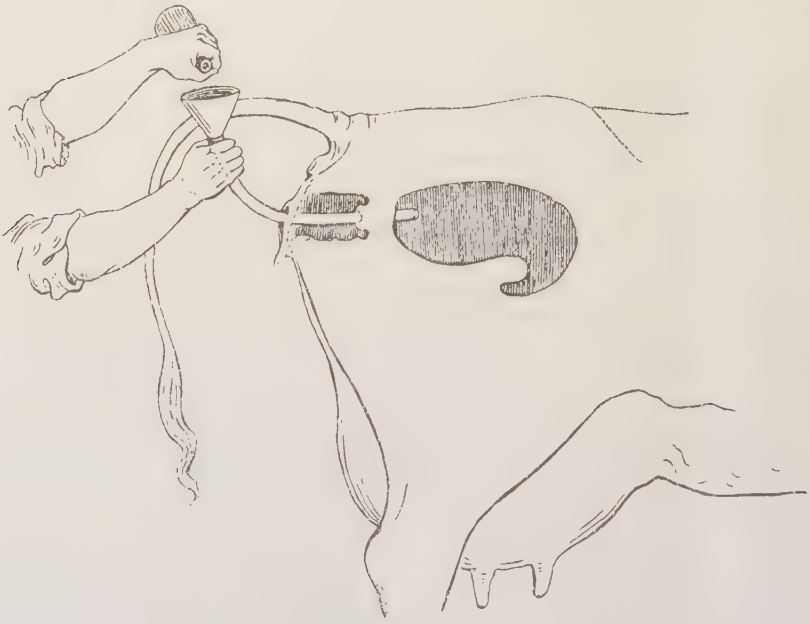
Diagnosis.—Diagnosis of the disease is made certain by the Agglutination Test which is carried out in a Laboratory. Blood samples should be forwarded to the Stock Department for this purpose. This will detect cows of which the blood is affected with the bacillus of contagious abortion.

TREATMENT.

Vaccines.—Up to the present no preventative vaccine has been produced which is efficacious. Therefore the "cleaning up" of a herd should be carried out by methods as set out below:—

1. When a cow aborts isolate her immediately, and keep isolated for four weeks.
2. Search for the fœtus (the aborted immature calf) and the afterbirth. These should be burnt thoroughly or buried deeply. When burying such material care should be taken when filling the hole to first throw in the soil removed from the ground surface.
3. Thoroughly dig up the ground afterwards together with an area of say three yards on every side and saturate the surface with a liberal supply of disinfectant.
4. The cow should be irrigated once daily for several days with the antiseptic solution perchloride of mercury (corrosive sublimate) 1 in 5,000; thence at weekly intervals if there be any discharge from the vagina. Tabloids for this purpose are specially made up and may be procured at the druggists. Such tabloids should be thoroughly dissolved.
5. The bull should be treated by irrigating with perchloride of mercury 1 in 5,000, although such animals have been proved of no potential danger unless reacting to the Agglutination test.

Method of procedure in treating cows.—For this purpose it is necessary to carry out irrigation with a 3ft. length of rubber tubing one-half inch in diameter and a small funnel which, if intended to be used with a perchloride of mercury solution, must be either of glass or enamelled metal. Other utensils used should not be of metal owing to the corrosive action of this drug. Apart from the



Method of irrigating a cow which has aborted.

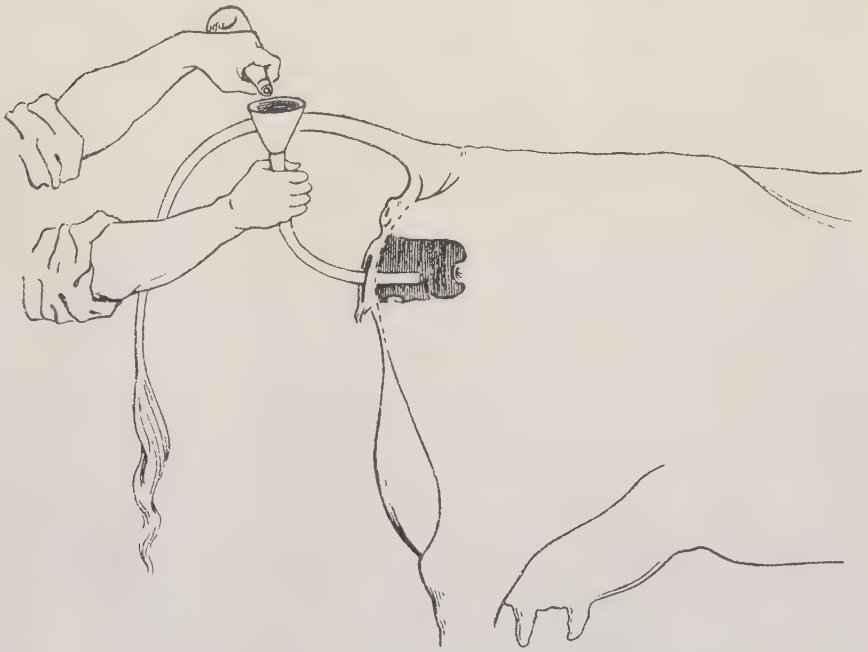
destruction of the container, chemical action takes place which renders the drug inert. For the treatment of the bull an ordinary enema syringe with vulcanite fittings should be obtained.

1. Boil for 5 minutes the tube and funnel and then apply to the outside of the tube a dressing of salad oil, good lard or vaseline.
2. Wash the hands and arms thoroughly in hot water to which disinfectant has been added.
3. When irrigating the cow pass the free end of the tube by means of the hand gently into the womb, or if the cow be sterile as far as possible into the vagina without undue force being used.
4. Hold the outer end of the tubing with the funnel inserted about six inches above the root of the cow's tail.
5. Pour the solution as described gently into the funnel and so thoroughly irrigate the parts. If the fluid does not flow freely from the tube the inner end need only be moved gently to and fro to secure a free flow.
6. Thoroughly wash down the parts from the root of the tail to the bottom of the udder, also inside of the tail with some of the same solution as used for irrigation.

7. The bull should be placed in a crush pen or otherwise made secure. Grasp the prepuce (sheath) by one hand and pass the nozzle of the syringe inside the sheath afterwards holding it in position with the same hand; with the other hand pump into the sheath a quantity of the solution to thoroughly irrigate the parts.

Disinfection of premises.—Stalls in which affected cows have been housed should be disinfected thoroughly with Izal Solution—1 in 20.

Sterility.—It is undeniable that careful and proper irrigation of the genital passages has generally resulted in the cow holding the bull after the first service. Sometimes, however, the trouble has persisted in spite of treatment, but it has not infrequently been found that the treatment has not been carried out thoroughly.



Method of irrigating a cow which is sterile.

The failure of cows to conceive after contagious abortion may be determined as due to the following causes:—

(a) Metritis or inflammation of the uterus.
(b) Cervicitis or inflammation of the Cervix.
(c) Acid solution in the passage.

The two former are undoubtedly due to neglect in treatment of the cow in the correct manner with antiseptics. The result is that a septic condition ensues. Such animals should be treated by irrigating with a solution of 1 in 2,500 of perchloride of mercury. In the latter case, where passage contents are acid, an alkaline wash is needed. The treatment necessary is to irrigate the passage just before service with a solution composed of 5 ounces of bi-carbonate of soda (baking soda) in half a gallon of water. This has often proved successful

and is specially recommended when no cases of contagious abortion are present in the herd and there is nothing to suggest that the contagion of this disease is responsible for the animal's failure to conceive.

Improper management of the bull is often the cause of cows failing to conceive. It is a bad practice to allow the bull to run at large with the herd. Such a practice has a tendency to overwork the bull and he becomes stale. If is far better to provide a special enclosure for the bull and bring the cows to him when ready and remove them again when properly served. The number of cows served during the year at regular intervals should be from 50 to 60 for each mature bull, whilst young bulls should be used sparingly. Bulls should be well fed and kept in good conditions—not overfat.

The improper use of perchloride of mercury should be avoided when irrigating the vagina. At least 48 hours should lapse between the time of irrigation and the time of service.

TOMATO CULTURE IN WESTERN AUSTRALIA

(Continued).

E. T. MORGAN,
Vegetable Inspector.

Selection of Soil.

The ideal soil for the production of the tomato crop is a good sandy loam which can be easily cultivated, thereby retaining moisture. For the early crop, land with a northerly aspect, which is in a warm situation, is the most suitable. Although a sandy loam is desirable, tomatoes are grown on many different classes of soil, but where the land is of a clayey nature, drainage must be provided, also cultivation must be carried out at the proper time, as the working of these soils in a wet condition, tends to make the surface bake and crack when subjected to warm dry weather, and moisture is therefore lost. However, when well and properly cultivated much of this type of land is producing good crops. The rich gully land of the hills and the river flats of the South-West are ideal spots for tomato culture. The border land of our peaty swamps is excellent for the growing of early crops, and the swamps have proved themselves to be ideal for the cultivation of the late crop. The Geraldton and Carnarvon districts, with their early seasons, are favourite tomato growing areas and the acreage is being increased yearly.

Drainage.

Many of our tomato growing localities do not require draining. This is generally the case with the border land of our swamps and on sandy loams with a free subsoil but where there is excess moisture this prevents æration, keeps down temperature, and retards plant growth. Soil warmth is greatly increased by proper drainage and this is an important feature when dealing with the production of an early crop. Also, well drained land is workable earlier than one which is in a sodden condition.

Irrigation.

The early crop, except in very light porous soils, seldom requires watering as sufficient rain usually falls to see the crop through. If the soil dries out, water must be applied. Water may be supplied by means of furrows or drains, and overhead sprinklers. Overhead sprinkling is the most satisfactory method, and where this system is utilised a very even distribution of water is possible. Where irrigation is practised by means of furrows, great care must be exercised in its application, as too much water is just as detrimental to the growth of the plants as is too little. On well graded land, however, watering is satisfactorily done by this method.

Manuring.

No crop responds more readily to correct manurial treatment than does the tomato. In order that plants may develop and mature normally, ten essential plant foods are necessary. Fortunately for us, most of these elements are contained in our agricultural soils and it is generally only necessary to supply phosphates, potash and nitrogen to ensure good results. These three plant foods must be balanced, as it is impossible for an excess of one constituent to make up for the lack of another. Each plant food ingredient has a duty of its own to perform. Briefly stated, the functions of the main plant foods as stated above are—

Nitrogen.

Nitrogen promotes the vegetative growth of the plant. Excess of nitrogen, with sufficient moisture, tends to make top growth, often to the detriment of the fruiting of the plant. A deficiency of nitrogen is seen in the general stunting of the plants and a yellowing of the foliage. The commonest form of nitrogenous fertiliser used by growers in this State is sulphate of ammonia. It is very soluble in water, therefore is quick acting. Nitrogenous manures, judiciously used, maintains growth at its maximum, without affecting the fruit-bearing qualities.

Phosphates.

Phosphates have important functions to fulfil, particularly the stimulation of root development, whereby a vigorous root system is produced. They also stimulate the flowering system of the plant and hasten ripening. Superphosphate and bonedust are the most generally used phosphatic fertilisers.

Potash.

Potash is an important constituent for plants which produce mainly carbohydrates, such as starch and sugar. It influences to a great degree the health and growth of plants. Plants are said to be more resistant to disease when well supplied with potash. Potash improves the carrying as well as the eating qualities of the fruit, besides increasing the proportion of marketable produce in the tomato crop. Sulphate of potash is the most generally used potassic fertiliser in this State.

Fertilising, therefore, should be done with a well balanced mixture, and where stable manure is obtainable, this commodity, in conjunction with a dressing of artificial manure, will maintain good growth and produce a satisfactory crop. Where stable manure is not procurable, the ploughing in of green stuff will furnish humus so necessary to our soils. As the tomato plant continues fruiting over a rather lengthy period it is a wise plan to fertilise with artificial mixtures at in-

tervals rather than to apply a heavy dressing at the time of planting out. Mixtures that have been found to give satisfactory results are Mount Lyell No. 4, Cuming Smith "E" Brand, and Cresco special potato manure. Blood and bone manure is used by many of our market gardeners with good results, but as the phosphoric acid contained in this mixture is only slowly available, the addition of superphosphate is beneficial. A mixture of four parts blood and bone, two parts of superphosphate, and one part of sulphate of potash is recommended as a good combination for many vegetable crops and for tomatoes has produced fine crops. It is suggested that from 15 to 16 cwts. is applied per acre, although many growers use a ton or more per acre with increasingly good results. If half the quantity per acre is applied at the time of planting and the other half when the plants carry their first flowers, the results should be most gratifying.

Stable manure may be broadcast and ploughed in prior to planting out, or may be applied in the holes excavated for the reception of the plants, mixing the manure, together with the artificial fertiliser, well with the soil.

Heavy dressings of nitrogenous fertilisers are not advised for the tomato, as rank top growth may be induced to the detriment of the fruiting qualities of the plant. Heavy top growth is not generally conducive to good fruit setting. Where plants have been bearing heavily, a dressing with a nitrogenous fertiliser is beneficial and will prolong the growth of the plant with increased fruit production. Sulphate of ammonia applied near the plant and watered in, if dry weather is experienced, is recommended, or as a liquid manure, a large handful in a kerosene tin of water should be applied round the base of the plant, not allowing it to come in direct contact with the foliage or slight burning may take place.

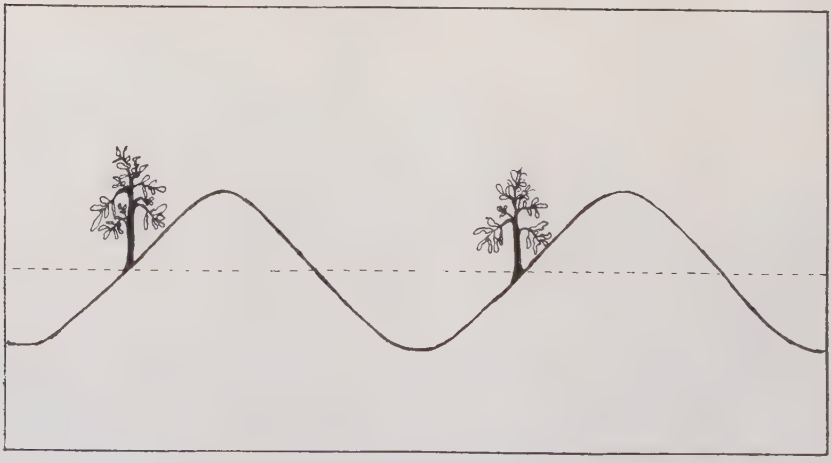


Fig. 1.

Transplanting.

When the plants have attained a height of from six to eight inches, they are ready to be removed to their permanent position. As the plants for the early crop are planted out in the beginning of winter, it is advisable to put the land up in ridges in order to facilitate drainage. The land to be utilised having been thoroughly worked, ridges are quite easily struck out with the plough. Manuring may be done at the time of ploughing. It is suggested that a furrow is ploughed each

way along the line to be planted, which should be marked out with sticks prior to the commencement of operations, allowing about three feet between the rows, so as to leave a V-shaped channel. The manure may be sown along this furrow. If the depth of ploughing is then increased and the furrows are ploughed back to form a ridge, the results will be a row ready for the putting out of the young plants. The young plants, when removed from the seed bed, should have their roots kept moist and protected from the effects of drying winds, if such obtain at the time of planting. The plants should be placed on the side of the ridge (as illustrated) instead of on the top—the earth at the back making for the protection of the young plants during stress of weather. Later, when the weather becomes warmer, the whole of the land may be levelled, this process being done without disturbing the root system, so leaving the soil well and deeply worked, and enabling the plants to maintain a regular and healthy growth.

Cultivation.

Cultivation should be carried out systematically in order to conserve moisture, aerate the soil and keep down weeds. No hard and fast rule can be laid down as to the number of cultivations necessary. This the grower will decide for himself. Where the land has been well prepared and the soil moisture has been maintained by thorough cultivation, there is seldom any necessity for irrigation in the growing of the early crop, but where irrigation has been done the land should be cultivated after each watering in order to maintain a fine surface mulch and to avoid baking and cracking of the soil.

Spacing.

No hard and fast rule can be laid down as to the distance apart that the plants shall be spaced. This depends a lot on the variety, district and time of planting. When the plants are staked and pruned it is usual to space the rows 3 to 4 feet apart, with the plants about 18 inches to 2 feet apart in the row. This will give ample room to allow of cultivation between the rows. A width favoured by many growers is 3 feet apart each way. This width allows for good growth of the plant without crowding, and permits cultivations and spraying.

Pruning.

In order to obtain the best results, tomato plants should be systematically pruned. Pruning often takes place in the seed-bed, as when plants are weak and spindly, pinching out the terminal bud will produce a more stocky and vigorous plant.

The main pruning is done when the plants are put out in their permanent positions, and consists of pinching out the superfluous laterals that start from the axil of the leaves on the main stem or stems. (See Fig. 2, p. 484.)

When the plants are staked, they are usually pruned to a single stem, which is topped when it reaches the top of the stake to which it is tied. The whole energy of the plant is then directed to the production of fruit, but sufficient foliage must be allowed to remain in order to allow of proper assimilation and to protect the fruit from sunburn. Pruning is recommended for the early crop, but the late crop

is seldom treated as the hot sun tends to burn the fruit, but some pruning can be done with beneficial results, as the checking of excessive leaf growth encourages fruit production.

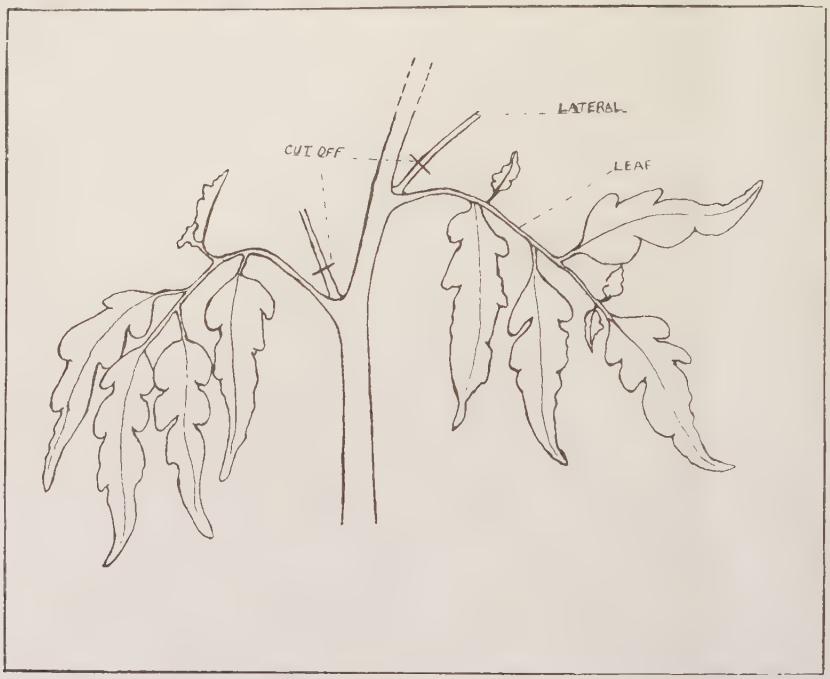


Fig. 2.

Trellising.

To obtain the best results, tomato plants should have some kind of support. To allow the plants to roam all over the ground, with the likelihood of the fruit getting dirty and worm eaten, is bad business; rot is encouraged by the fruit lying on the damp ground, cultivation is interfered with, and picking and spraying for the control of insect pests are rendered difficult.

Several methods of support are adopted by growers. Mulching with straw or other litter between the rows is carried out. This method certainly keeps the fruit off the ground, but better results are obtained by staking. Trellising may be carried out by running wires between posts placed at either end, one wire about 2 feet from the ground, and the other about 18 inches or 2 feet above this, a stake being placed near each plant, so that the main stem may be tied as growth proceeds. Another method is to build a framework with light saplings on the same principle. This is adopted by at least two of our most successful growers in the Balcatta district.

Another method of support, largely adopted in the metropolitan area, is to place four stakes about 4 or 5 feet long around each plant; strips of bagging about 1½ inches wide are fastened round the stakes at about a foot from the ground, and, as growth continues, further strips are used higher up the stakes. It is not advisable to have the stakes too close in to the plant, or the tendency will be for the plants to be bunched too much, and not allowed sufficient sunlight to enable the plant to do of its best and mature its fruit.

Gathering and Marketing.

The exact stage of ripeness at which the fruit is gathered depends on the market to which it has to be sent and the time occupied in the transit thereto. In no case, however, should the fruit be picked until it has fully developed, which does not mean that it is showing colour, but that the pulp surrounding the seeds has filled the inside cells of the fruit and is becoming jelly-like.

In most varieties there is a slight fading of the dark green colour of the skin at the apex of the fruit, as well as slight browning at the point at which the fruit is attached to the stem. If gathered at an earlier stage the flavour will never be fully developed. Gathered at this stage it can be sent to distant markets without difficulty, but where the market is close, the fruit may be allowed to become coloured before being picked. As the fruit, once it has become fully developed, matures rapidly, it is necessary to go over the plants frequently, as if this is not done a quantity of the fruit is apt to become over-ripe and unsuitable for market.

The produce should be handled carefully and all badly blemished or diseased fruit discarded. These should not, however, be left lying on the ground, but should be destroyed, as diseased fruit lying about may be the means of spreading disease throughout the garden.

The sound fruit is taken to the packing shed, where it is graded and packed, usually in cases containing ¾ of a bushel. Grading should be done on the basis of colour as well as size. It is a mistake to pack green and coloured fruit in one case; if each is placed in a separate case better prices will generally be realised.

Seed Potatoes

Can YOU afford to grow poor crops?

When the quality of the seed that is planted is of such vital importance, no grower can be content with any but the best.

As the result of several years treatment our strain of DELAWARE POTATOES ranks with the best in the State, and may be relied on to give the best possible results.

We grow FOUR STUD CROPS per year from root selected seed, and are in a position to supply growers with best quality seed for any season's planting.

SIX FIRST PRIZES at the Albany Show.

Inquiries for supplies should be forwarded in good time.

H. C. POOLE, Seed Potato Specialist.

Phone 2, Lower Kalgan. **Lower Kalgan via Abany.**

1—1

THE PRODUCTION OF LAMBS FOR EXPORT.

GEO. L. SUTTON, Director of Agriculture.

It is apparent that the production of lambs in this State now exceeds, and will continue to exceed, to a greater extent than at present, the requirements for local consumption. The production of lambs for export is, therefore, obviously called for.

Probably no branch of the sheep industry furnishes such quick returns. Though the price of export lambs is lower than that which has obtained for those purchased for local consumption, yet a well-grown lamb four to five months old is frequently worth more than a wether several months older, and the profits from lambs are not unlikely to be greater than those of a whole year from even the most profitable wool types. Lamb raising, too, is eminently suited to the conditions of our agricultural areas, in that it enables the maximum number of stock to be carried during our mild winter when the feed is most succulent and most abundant, and enables the numbers to be reduced to the minimum when our pastures are driest and scantiest.

Standards for the local lamb market are considerably less exacting than those necessary to satisfy export requirements. For local consumption a well-grown, "fresh" or "sappy" Merino lamb is suitable, though not so for export purposes; it does not possess the necessary bloom, nor is the colour satisfactory. The requirements for export are that the carcase shall be fresh and not dry, compact and symmetrical, evenly coated with flesh, but not over fat, with light bone, thick shoulders, a plump leg and good loin. This necessitates the U-shaped hind-quarters rather than V-shaped lankiness, which always results in a reduced price.

Definite information regarding the unsuitability of the pure Merino lamb for export is furnished by the experiments conducted at Roseworthy, South Australia. These showed that not only did such a lamb mature too slowly, but that 18.33 per cent. failed to reach even the third-quality standard for the export lamb. Of those which reached the export standard, 40 per cent. were classed as third-quality grade; 33⅓ per cent. as second-quality only, and 8.34 per cent. as first-quality.

Just as there is need for specialisation in other avenues of agricultural production, so there is need for it in lamb raising, and this requires that the lamb raiser shall mate good ewes (not necessarily young ewes) of one type with rams of one pure breed. It must be understood, of course, that the rams on different farms need not be of the same breed. To produce the essential carcase requirements for export lambs already specified, the animal will require to have a compact, symmetrical body, wide chest, broad back, thick flanks and short legs.

There is absolute unanimity amongst those experienced in the lamb export trade in Australia, New Zealand, and Great Britain that no animal will conform to this description unless sired by one of the Downs breeds. *To achieve full success the use of a Downs ram is imperative, and which should be mated with Longwool Merino crossbreds rather than with Merinos.*

The "Downs" sheep, which are best known in Western Australia, are the "Dorset Down," or, as it is more commonly called, the "Dorset Horn," the Shropshire" and the "Southdown," and it is suggested that the merits and possibilities of these, under Western Australian conditions, be thoroughly determined before recommending, for general use, the lesser known Suffolk, Oxford Down, Hampshire Down, or others.

Quick maturity in connection with lamb production is essential, as the lambs should not be weaned before being marketed. Further, they require to be marketed unshorn, and before they are likely to suffer from the effects of grass and other seeds.

Of the better known breeds referred to, the Dorset Horn lamb is more vigorous, and matures more quickly than the Shropshire. The Southdown lamb matures least rapidly of the three breeds referred to, though it is generally recognised that the progeny of this breed has the most shapely carcase. This advantage, however, may be more than offset in this State by the quicker maturing qualities of the other two breeds, and the need for quick maturity in a short season. Further, for some years to come it is certain that the Merino will be required to be used as the mother, and in this connection there is a very general belief that the Dorset Horn is more suitable for mating with the Merino than the other two breeds. On this point there is a great need for definite information under our local conditions, and with this object in view experiments have been planned to be carried out at the Avondale State Farm, whereby the Dorset Horn, Shropshire and Southdown rams will be mated with both Merino and with Border Leicester-Merino ewes in order to determine the type of lamb produced when mated as indicated.

The relative export stage maturity of the different types of lambs is approximately as follows:—

Dorset Horn × Longwool Merino Crossbred—14 to 16 weeks.
Shropshire × Longwool Merino Crossbred—15 to 17 weeks.
Southdown × Longwool Merino Crossbred—16 to 18 weeks.
Merino—18 to 22 weeks.

Because of the specialisation in wool, which has been practised in Western Australia in common with other parts of Australia, the predominant type of ewe available for lamb production is the Merino, and, in consequence, at present, and for some years to come, it is this ewe that will be used. The Merino ewe, however, is not very suitable for the purpose; in the first place it is slow maturing, and, because of this characteristic, its milk supply is comparatively light and not sufficient to properly satisfy the needs of a vigorous and quickly maturing crossbred lamb of the Downs type. For this purpose a ewe of the Downs type would undoubtedly be the most suitable, but there are not sufficient in Australia to meet the needs of our lamb raisers. Further, it must not be forgotten that the dam of the export lamb has to be carried over the whole year, during which time it is producing a fleece. The wool it carries should, therefore, be of the most valuable kind and the largest quantity possible under the circumstances. Ewes of the Downs type are very much inferior in this respect to the Merino, which stands supreme.

Though the Merino is essentially the predominant wool type, it is not the only good wool type, and the experiments conducted at Roseworthy in South Australia, and at Bathurst, Cowra and Wagga, in New South Wales, have shown that, as the result of mating British rams of the long-wool type with the Merino, a crossbred ewe is produced, which makes an excellent mother for the export lamb, whilst at the same time producing a very profitable fleece. Further, many of the progeny, particularly of the "English Leicester" and "Border Leicester," are first-quality export lambs. In this connection it is pointed out that it is by the use of such crossbred or halfbred long-wool ewes mated with rams of the Downs type that many of the famous Canterbury export lambs of New Zealand have been produced.

The experiments referred to were conducted with "Lincoln," "English Leicester," "Border Leicester," and "Romney Marsh" rams mated with Merino ewes. A mass of information has been obtained from them, which shows that the Lincoln-Merino crossbred invariably produces the greatest weight of fleece, and the Border Leicester crossbred invariably produces the earliest maturing mother and the heaviest body weight, both as a lamb and an adult sheep, whilst the English Leicester-Merino crossbred produces the most shapely type of animal and finest

wool. The "Romney Marsh," when mated with the Merino, produces a good fleece, though a less shapely animal, but in districts where Foot Rot is likely to be troublesome, the Romney is to be used despite this slight drawback, for it possesses very strong inherent resistance to this disease.

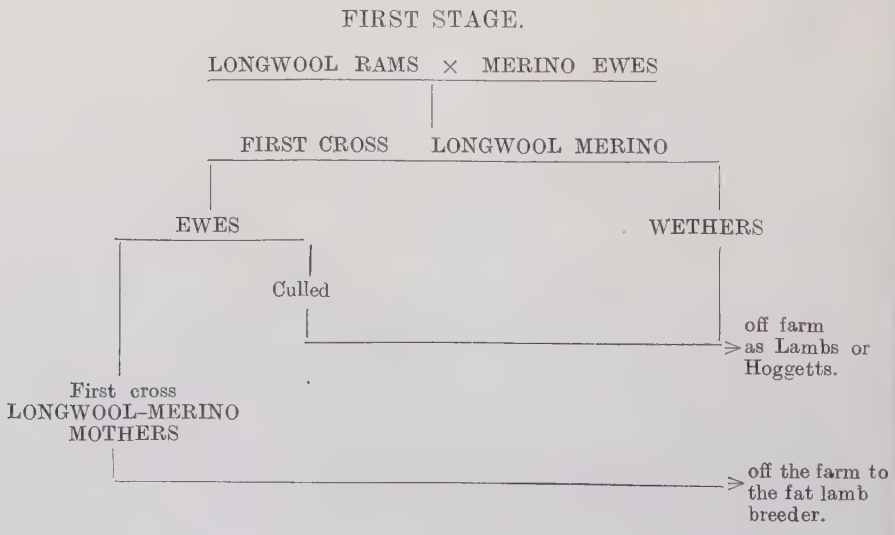
The experiments show conclusively and very definitely that, whereas the Merino ewe itself is not very suitable, yet when mated with any of the long-wool breeds referred to—"Lincoln," "English Leicester," "Border Leicester," or "Romney Marsh"—a ewe is obtained which is admirably suited for mating with a ram of the Downs type in order to produce fat lambs, either for local consumption or for export.

It is sometimes claimed that the "Corriedale" can take the place of the Downs sire. It is, however, believed that it is more suitable to take the place of the Long-wool-Merino crossbred, and when used in this way should be mated with a Downs ram.

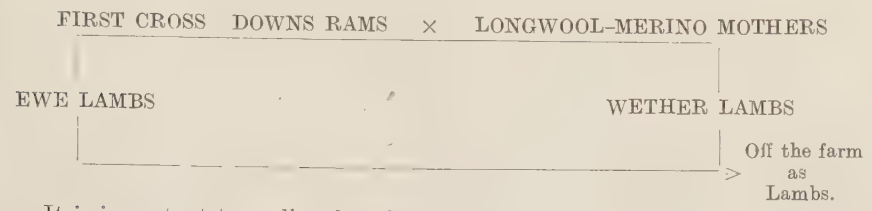
The production of fat lambs may, therefore, be divided into two distinct stages—the first stage, the production of the crossbred long-wool mothers by mating the Merino ewe with rams of either the "Lincoln," "English Leicester," "Border Leicester," or "Romney Marsh" breeds, and the second stage, the production of the fat lamb by mating the long-wool crossbred mother with one of the Downs rams, *i.e.*, Dorset Horn, Shropshire or Southdown.

Because of its quick maturing qualities, with ability to produce the greatest body weight, the Border Leicester is likely to suit those districts where the rainfall is lightest and pastures scantiest. It will prove least suitable where the rainfall is heaviest, and particularly in those districts subject to worm infestation, for the "Border Leicester" is particularly subject to these parasites. On better pastures and rich land the "English Leicester" and "Lincoln" can be used to advantage, whilst in districts subject to Foot Rot the "Romney" will prove most suitable. Similarly the "Dorset Horn," because of its vigour and early maturing, is likely to prove more suitable than the "Shropshire" or "Southdown" for districts in which the period over which succulent pastures are available is shortest.

The two stages necessary in connection with the production of fat lambs may be shown graphically as follows:—



SECOND STAGE.



It is important to realise that the progeny of the second cross is an unprofitable wool producer, and, as shown in the diagram, lambs of both sexes should be marketed as lambs. Unless the conditions are such as will ensure this, the farmer should devote his attention to the raising of the Longwool-Merino crossbred mothers, or of pure Merinos.

Because it is unprofitable to carry over lambs sired by Downs rams, whether from Merino or crossbred Merino ewes, and because the Longwool Merino crossbred ewes are such good mothers, and a large percentage of both ewe and wether lambs are first-quality for export, if well fed, it is recommended that the Merino ewe be mated with a Longwool ram rather than with a Downs ram.

Though breeding on the right lines is essential, proper feeding is also necessary.

Success with the export lamb involves a rapid increase in body weight from the time it is dropped until sent to market. This demands a much better food supply than is necessary in the case of the more slowly maturing Merino. This need is to some extent provided for by using the crossbred long-wool dam whose milk supply is much superior to that of the Merino ewe. In order that this milk supply may be available at the birth of the lamb, and maintained afterwards—for the lamb should be fed mainly through its mother—the needs of the dam are such that it should not be short of food prior to lambing, and further, should have an ample supply of succulent food after lambing. In most districts this will necessitate the growing of crops to provide succulent food before such is normally available, and later to supplement the pastures. For this purpose such crops as the early maturing varieties of oats—Mulga and Burt's Early—rape and barley are admirably suited. Where conditions suit it nothing is better than lucerne. On farms where the feed is very watery it may be necessary to supplement the over-succulent pasture with some dry feed in order to secure the bloom and finish necessary on the export lamb.

Because the export lamb must be sold as a sucker, unremitting attention to the needs of its mother and itself is necessary in order to ensure that it shall not suffer any check and its growth be hindered by rough handling and unnecessary movement. For this reason the lamb marking should be carried out with the greatest of care to prevent injury to the muscles. To avoid undue loss of blood and to prevent excessive shock the lamb will require to be marked at an early age, say, when 10 to 14 days old, and this will necessitate two or more markings. To avoid unnecessary handlings and bruising a drafting race and suitable yards are essential when selecting a line for market.

Each quality of export lambs is graded according to weight. The carcase weights of the different grades on the hooks at the freezing works are as follow.—

1st Grade—28 to 36 lbs.
2nd Grade—37 to 42 lbs.
3rd Grade—43 lbs. and over.

The 1st grade may be set down as being usually worth ½d. per lb. more than the 2nd grade, and ¾d. per lb. more than the 3rd grade. The grades are known in the trade as "2," "8," and "4" respectively.

The South Australian experiments show that the Merino lamb loses about 59 per cent. of its live weight from farm to the carcase weight at the freezing works,

whilst the Downs Longwool-Merino lamb loses about 54 per cent. Using these figures it follows that on the farm the live weights of well finished Merino lambs intended for export should range from 70 to 90 lbs. and of Downs crossbred lambs from 60 to 80 lbs.

Because of the necessity of having the lambs well finished and ready before the grass and other seeds are troublesome, it is necessary to have them dropped early, say, in April, and, if the pastures cannot be relied upon to produce suitable succulent feed for the ewes at this time, such should be provided by means of grazing crops or by silage.

Lambing in April means mating in November, and, as the British breeds do not readily mate as early as Merinos, it is advisable to use 2½ per cent. of rams rather than 2 per cent. as is the case with Merinos.

Crossbreds have the advantage that they are decidedly better scavengers than Merinos and, therefore, are more suitable for cleaning fallows and controlling weeds. They, however, require better fences to hold them, and, in fact, it is doubtful whether any fence other than a netting fence can be relied upon.

If all the stages connected with the production of fat lambs are carried out on the one holding the work requires considerably more forethought, and becomes considerably more complicated than is the case in connection with the production of wool from a Merino flock. It necessitates facilities for mating with three different breeds of rams—Merino, Longwool and Downs—and the carrying of three distinct flocks, viz., a Merino flock, a Longwool-Merino flock, and the Downs lambs. Very few holdings can provide these facilities, and it is believed that export lamb production can never occupy the important position it should in connection with Western Australian agriculture unless the farm management work associated with it can be simplified so that any farmer need only keep one breed of ram. It is believed that this can be achieved if the two stages of lamb production already referred to be considered as separate and distinct activities of individual farmers. Thus, some farmers will raise the Longwool-Merino mothers, as the result of purchasing Merino ewes and mating them with a British Longwool ram, and others will produce the export lamb by mating a Downs ram with the Longwool-Merino mother purchased from those raising it. In this connection it will be found that all districts in the agricultural areas are not entirely suitable for the production of fat lambs, and, in consequence, it is expected that export lambs will be produced mainly in the later or wetter districts, the Crossbred mothers in the intermediate, and the Merino mothers in the pastoral and the very early districts of the Wheat Belt.

SUMMARY.

The sire of the fat lamb for export should be a—

"Dorset Horn," "Shropshire," or "Southdown."

The mother of the export lamb should be a Longwool-Merino crossbred ewe, if available.

If crossbred ewes are not available, mate the Merino ewe with a Longwool ram.

Mating should take place in November, and provision made for ample succulent feed in April, and thence onwards by means of fodder crops or silage.

Well finished, light-weight lambs bring highest prices.

Lambs should be handled carefully, fed through, marketed unshorn and direct from their mothers.

The later and wetter agricultural districts are most suitable for the raising of the lamb for export.

The intermediate districts for the Longwool-Merino crossbred mothers, and

The pastoral and very early districts of the Wheat Belt for the Merino mothers of the Longwool crossbreds.

AGRICULTURAL SEEDS AND THEIR WEED SEED IMPURITIES.

H. G. ELLIOTT, Dip. Agric.
Assistant Plant Pathologist.

With the exception of seeds of Wheat, Oats, Barley, Subterranean and Drooping Flowered Clovers, the majority of the agricultural seeds sown in Western Australia are imported either from the Eastern States or overseas countries.

It is well known that the average sample of clover or grass seed has greatly improved in quality, especially as regards cleanliness and purity from weed seeds, during the past thirty years. This improvement is due to—

1. The great improvement of harvesting and cleaning machinery.
2. The purchase of seeds from reliable firms.
3. The establishment of seed testing stations.
4. State and Commonwealth Acts which prohibit the sale or entry of seeds containing noxious weed seeds.
5. The farmers' better knowledge of the harm done by sowing noxious weed seeds.

However, despite all these factors which have tended to raise the standard of the seeds sold, there are still many very inferior grades of seed on the market to-day. This is due to the purchaser's ignorance of the amount of harm done by certain weeds, and to his not being able to recognise the weed seeds present in a bad sample when he sees it, or to his desire to purchase a cheap line without a guarantee.

The presence of weed seeds in agricultural seed is the rule rather than the exception. It is very seldom that commercial seed is free from some seeds of weeds or other crops.

Perhaps it would be advisable to define what is meant by "Weed Seeds." From a farmer's point of view, any plant out of its place, even if it is a useful one, is a weed, so that if he buys, for instance, subterranean clover containing turnip seed, or *vice versa*, he is sowing a weed, although, in their places, both are valuable plants.

Wheat, Oats and Lucerne are amongst the cleanest of machine-threshed crops, but a certain sample of imported lucerne seed examined contained no fewer than 23 species of weed seeds, four of which were noxious under the State Agricultural Seed Act, 1923.

The introduction of new and foreign species of weed seeds is due, in most instances, to their presence in consignments of grass, clover or other commercial seeds from overseas and the Eastern States. Thus it can be seen how foreign weeds may result from the direct planting of crop seeds containing such seeds.

Certain weeds, either because they possess poisonous qualities, or because of the difficulty of eradicating them when they are once established, or from the harm they do to the crop, are called noxious weeds.

The revised list of noxious weeds under the Agricultural Seeds Act, 1923, as gazetted on page 1828 of the *Government Gazette*, 15th August, 1930, is as follows:—

Alternanthera Achryantha, var echinata	(Khaki Weed).
Ambrosia spp.	
Argemone mexicana	(Mexican Poppy).
Asperula azurea	
Asphodelus fistulosus	(Onion Weed).
Bartsia viscosa	(Yellow Weed).
Bartsia trixago	(Sticky Weed).
Brassica sinapistrum	(Charlock).
Brassica Tournefortii	(Wild Turnip).
Bromus secalinus	(Cheat).
Carduus spp.	(Thistles).
Carthamus spp.	(Thistles).
Centaurea spp.	(Thistles).
Cnicus spp.	(Thistles).
Cuscuta spp.	(Dodder).
Chondrilla juncea	(Skeleton Weed).
Cucumis myriocarpus	(Paddy Melon, or Gooseberry Cucumber).
Cyperus spp.	(Nut Grass).
Datura stramonium	(Thorn Apple).
Echium spp.	(Viper's Bugloss).
Emex australis	(Double Gee).
Euphorbia segetalis	(Carnation Weed).
Euphorbia terracina	(Carnation Weed).
Foeniculum vulgare	(Fennel).
Galium aparine	(Cleavers).
Gilia squarrosa	(Californian Stink Weed).
Gomphocarpus fruticosus (Asclepias fruticosa)	(Cotton Bush).
Guizotia abyssinica	
Homeria collina	(Cape Tulip).
Hypericum perforatum	(St. John's Wort).
Inula graveolens	(Stinkwort).
Iva axillaris	(Poverty Weed).
Kentrophyllum lanatum (Carthamus lanatus)	(Saffron (Star) Thistle).
Lactuca scariola	(Wild Lettuce).
Lapsana communis	(Nipplewort).
Lepidium Draba	(Hoary Cress).
Lupinus luteus	(Yellow Lupin).
Lychinis Githago	(Corncockle).
Onopordon spp.	(Thistles).
Opuntia spp.	(Prickly Pears).
Orobanche cernua	(Broom Rape).
Polygonum spp.	(Bindweed).
Raphanus raphanistrum	(Wild Radish).
Reseda luteola	(Wild Mignonette).
Romulea rosea	(Guildford Grass).
Salsola Kali-tragus	(Russian Thistle).
Saponaria vaccaria	(Cowcockle).
Solanum sodomaeum	(Apple of Sodom).
Solanum rostratum	(Buffalo Burr).
Sonchus arvensis	(Perennial Sow Thistle).
Sonchus asper	(Rough Sow Thistle).
Tripteris clandestina	(Stinking Roger).
Tussilago farfara	(Coltsfoot).
Xanthium spp.	(Burrs).

NOTE.—This means that the sale or exposure for sale of samples of seed containing any of the above weed seeds is illegal under the Agricultural Seeds Act of Western Australia (1923).

Foreign Seeds found in Commercial Seed Samples.

The following named species of weed or foreign seeds have been found in commercial samples of seeds examined during the past seven years. All the seed samples were either offered for sale in this State or examined under the Commonwalth Quarantine Regulations.

[Except where otherwise stated (by numbers in brackets after the name) the weed seed impurities have only been found once.]

1. GRAMINEAE.

Scientific Name.	Common Name.
i. Andropogon (Sorghum) sudanese	Sudan Grass
Containing :—	
A. *Legumes*—	
Medicago denticulata	Burr Medic (2)
M. sativa	Lucerne
Pisum arvense	Field Pea (2)
B. *Grasses*—	
Avena fatua	Black Oat (2)
A. sativa	Oat (2)
Bromus unioloides	Prairie Grass (2)
Lolium perenne	Perennial Rye-grass (3)
Setaria italica	Millets (15)
S. viridis	Pigeon Grass (2)
C. *Other Weeds*—	
Brassica napus	Rape
Brassica nigra	Black Mustard
Chenopodium album	Mexican Spinach
*Datura stramonium	Thorn Apple
Malva rotundifolia	Mallow (7)
Petroselinum sativum	Parsley
Rumex spp.	Docks (2)
*Xanthium spinosum	Bathurst Burr (4)
ii. Panicum miliaceum	French Millet
Containing :—	
A. *Grasses*—	
Andropogon sorghum	Sorghum
Setaria italica	Millets (5)
B. *Other Weeds*—	
Fagopyrum esculentum	Buckwheat
*Polygonum convolvulus	Black Bindweed
iii. Phalaris canariensis	Canary Grass
Containing :—	
A. *Grasses*—	
Avena sativa	Oat (2)
Bromus maximus	Large Brome Grass
Lolium temulentum	Drake (3)
Panicum miliaceum	French Millet
Triticum sativum	Wheat
B. *Other Weeds*—	
Amaranthus retroflexus	Pigweed
Brassica arvensis	Wild Mustard
Brassica nigra	Black Mustard (2)
*Centaurea cyaneus	Star Thistle
Chrysanthemum sp.	Ox-eye Daisy
*Convolvulus arvensis	Lesser Bindweed (2)
*Galium aparine	Cleavers (2)
Linum usitatissimum	Linseed
Rumex spp.	Docks (3)
*Raphanus raphanistrum	Wild Radish

Scientific Name.	Common Name.
iv. Avena sativa	Oat
Containing :—	
A. *Legumes*—	
Trifolium agrarium	Hop Clover (2)
B. *Grasses*—	
Avena fatua	Black Oat (5)
A. sterilis	False Wild Oat (3)
Hordeum vulgare	Barley (13)
Lolium subulutum	Wimmera Rye-grass (4)
L. temulentum	Drake (2)
Triticum sativum	Wheat (7)
C. *Other Weeds*—	
Brassica nigra	Black Mustard (6)
*B. sinapistrum	Charlock (2)
Lychnis alba	White Campion (2)
*Polygonum convolvulus	Black Bindweed (4)
Rumex spp.	Docks (5)
Scandix Pecten-Veneris	Shepherd's Needle (2)
Scabiosa arvensis	Field Scabious (2)
v. Holcus lanatus	Yorkshire Fog
Containing :—	
A. *Legumes*—	
Trifolium dubium	Suckling Clover (2)
T. repens	White Clover
B. *Grasses* -	
Agropyrum repens	Quack Grass
*Bromus secalinus	Cheat or Chess
Cynosurus cristatus	Crested Dogstail
Lolium multiflorum	Italian Ryegrass
L. perenne	Perennial Rye-grass
Phleum pratense	Timothy
C. *Other Weeds*—	
Myosotis sp.	Forget-me-not
Plantago lanceolat	Rib Grass
Ranunculus repens	Creeping Buttercup
Rumex acetosella	Sorrel

* Noxious weeds under the Agricultural Seed Act, 1923.

(*To be continued*).

BREEDERS OF TAMWORTH-BERKSHIRE BREEDING SOWS.

Numerous inquiries are being received at the Department of Agriculture from farmers desirous of purchasing sows produced by mating pure bred Tamworth and pure bred Berkshire parents, as to where such stock may be obtained. The following list of farmers who are breeding these desirable first cross sows is, therefore, supplied, and will be supplemented from time to time as the information becomes available:—E. A. Ryan, "Fairfields," Pingrup; J. & S. F. Vaux, Ongerup; L. W. Barrows, Ballidu; G. M. Webb, Kojonup; H. Noon, Katterup; Hillier & Monti, Karridale; Manager, Sanatorium Farm, Wooroloo; Manager, Stud Farm, Denmark; D. T. Bantock, Wanneroo; W. G. Burges, "Tipperary," Burges' Siding; A. G. Oliver, Wickepin.

COMB HONEY PRODUCTION.

In the production of comb honey, there are three important factors to be taken into consideration. First, there must be a honey flow on. Second, bees must be strong and bubbling over. Third, the strain of bees must be such as will work in the small square boxes.

Definition.—When comb honey is spoken of, it is usually intended to mean honey in the comb in small boxes, usually about 1 pound just as it comes from the hive. These boxes are called sections and are made to fit either "Ideal" or half depth supers. It is also referred to as section honey, which is probably the better name of the two. The large frames such as Langstroth, Ideal and half depth are usually spoken of as combs of honey, and are not a standard on the market in the way that sections of comb honey are.

Beginner's Luck.—Many beginners, when starting beekeeping, are anxious to produce sections of honey; they have no extractor and want honey in the comb for the table. The first thing done after obtaining a hive is to put on a queen excluder and a box of sections. More often than not, they are greatly disappointed; the bees swarm without having done any work in the sections; the sections are left on all the season and yet there is little or no honey therein. The beginner says there is no honey in his district and it is no good for bees.

Of course there are exceptions to this. If the beginner is fortunate in obtaining a really strong hive and putting the sections on just as the honey flow starts, all is then well and he is keen to continue, and may later become a successful beekeeper.

First.—To obtain good sections, there must be a good honey flow. By this is meant that there are a large number of flowers in blossom containing nectar so that the bees are able to store honey very rapidly.

There is so much honey to be obtained, and the bees are so anxious to secure a store of it, that they will utilise every available space in the hive.

In the spring, when breeding is taking place, the brood require such a large quantity of honey and pollen, that very little surplus is stored, but when the hive is full of bees, and there are millions of attractive cups containing the "Nectar of the Gods," our industrious little friends will toil from dawn to dusk to fill every corner of their larder, and the sections are quickly filled and beautifully capped.

But when the honey flow is poor or intermittent, honey is brought in so slowly and irregularly that the sections are poorly filled, badly capped, and travel stained.

Sections should not be placed on the hive until there is promise of a good flow of honey, or they are liable to be spoilt by irregular work and discoloration, before the real work begins. It is necessary, therefore, for the beekeeper to know something of the flora of his district and when to expect the honey crop.

Second.—Bees must be strong and bubbling over. By this we mean that as soon as the cover of the hive is removed the bees come pouring out from between the combs, the tops of all the frames being almost immediately covered with bees, which then begin pouring over the sides of the hive.

When a hive is in this condition, it is ready to receive sections for comb honey. But very often, it is also ready to swarm, and of course, if this occurs,

there will not be sufficient bees left to fill the sections, which will be neglected until the hive is again full of bees.

It must also be remembered that it is necessary to have bees of the right age, that is field bees, old enough to go out and gather the available nectar. Very few bees become field bees under two weeks old. It is, therefore, necessary that the eggs that produce the field bees for the expected harvest should be laid five or six weeks before it commences.

In selecting colonies for section honey production, it is important to select those that have come through the winter strong and that have a young, vigorous queen. If few of these are available, it will be best to unite two of medium strength.

As stated above the beekeeper must first learn when to expect the honey flow, then about two months before this he must begin to get his hives ready to take advantage of it.

Now, having realised that what is required is a hive boiling over with bees of the right age, and yet not desiring to swarm, we have the difficult problem of how to obtain this.

A method of obtaining a large number of bees, when working for extracted honey, is the Demaree method. The principle of this being raising the brood above a queen excluder leaving the queen on say one frame of brood below, the rest being empty combs, so that the queen has plenty of room to lay, the young bees hatching out above the excluder. In some cases the empty combs for extracted honey are placed above the brood while in others they are placed between the brood and the excluder. This principle is also useful in working for comb honey.

Having selected a suitable colony with a strong vigorous queen give her plenty of room and induce her to fill as many storeys as possible. The hive should then contain a large number of wax workers as well as field bees. When this has been obtained, one method is to take away all surplus storeys, crowding the bees and brood into one or two storeys, and if there is too much brood, taking some away, of course, making sure that there are no queen cells left, then placing the box of sections on top and as soon as the middle sections have been drawn out, filled, and capping started, raise the box and place another empty one underneath.

Another method after the Demaree plan is that adopted by S. Cushman of the United States of America. He says—"I insert the first comb honey super over the lower brood chamber (full of brood and having a queen) with a queen excluder between. Over this, first one or two supers are placed, then above these another lot of brood belonging to this colony or from another colony. The supers are then tiered up between these lots of brood until enough have been drawn out to avoid crowding the breeding space below, when the conditions are practically the same as in the hive run for extracted honey. Thus we give our comb-honey colonies more brood from other colonies if necessary, instead of taking any away."

There are several objections to this method, one being that the bees are liable to store honey in the top brood chamber as fast as the brood hatches. This, however, might be overcome by keeping this top chamber supplied with full brood combs from other hives, and later removing it altogether, also any supers of shallow frames, leaving only the section boxes.

Discussing the question of comb honey productions Cushman says—"Can we manage a comb honey colony so as to employ in the hive through the season all the bees it can produce, prevent any swarms issuing, avoid any desire to swarm,

and give more and more comb builders than they can produce themselves? That is instead of robbing them of their comb builders, give them an unlimited number at will."

In dealing with two medium strength colonies, the following method may be adopted. First place the two hives close together a few days before operating, then from one hive remove all uncapped brood and stores, leaving all bees and capped brood in the brood chamber.

From the other hive, take all frames of capped brood without bees, and put them into the first hive, which will now contain only the queen, bees, and capped brood. If there are not sufficient frames of brood, the space may be filled temporarily with frame dummies. Place a comb honey super on top of this. The uncapped brood and honey from No. 1 may be placed in No. 2, which should then be moved away, so that its flying bees may join No. 1, when returning.

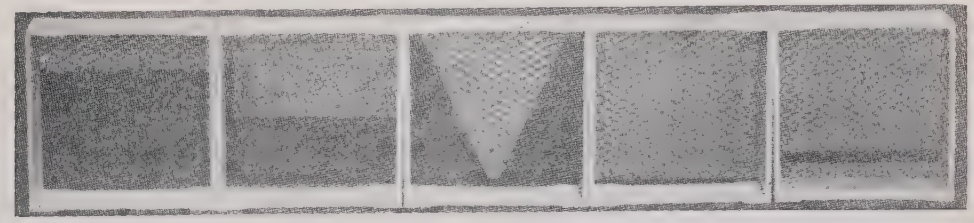
The first hive will now have very little room in the brood chamber to store honey, but empty cells will be provided for the queen to lay in as the brood emerges. Above in the section box there will be room for the comb builders and honey gatherers, who will be forced up into this on account of there being no space for them to work in, in the brood chamber.

Whatever method is adopted it must be borne in mind that the object of the beekeeper is to have plenty of bees, both of the comb building and the fielding age, crowded into the section supers. At the same time the brood chamber must not be so crowded as to give the bees a desire to swarm.

In the *third* place, a suitable strain of bees must be selected. There is always a good market for well filled, clean sections with white cappings. It is generally considered that Italian bees do not produce such white cappings as the blacks or hybrids, but this is not an infallible rule; some strains of pure Italians will produce good white cappings. In selecting a colony for comb honey it should, therefore, be noted how the bees usually cap their honey.

Carniolan bees are noted for their white capping, and are, therefore, particularly suitable for producing comb honey. Some of the finest selections I have seen were produced by Carni—Italian cross at Mr. Hall's apiary at Manjimup.

It will be found that some colonies take to sections much better than others, and it may be found advisable to discard some colonies from comb honey production and keep them for extracted honey.



Preparation of Sections.—All sections must be prepared with foundation or small pieces of drawn comb. It is always advisable to have a few sections in the centre of the crate fitted with small pieces of drawn comb, which may be fixed with a little melted wax; or better still, incompleted sections left over from last season.

There are several methods of using the foundation as illustrated but that which is generally most satisfactory is the full sheet, or the large sheet at the top with a space of about ¼ inch between it and the narrow strip at the bottom. Either of these methods usually produces well drawn out sections fixed to the bottom of the box.

The section box usually used is the one piece section folded at the corners after damping; some are quite plain and the foundation is fixed with melted wax, others have a slot cut which grips the foundation when folded. The sections are then placed in section holders or carriers which are placed in the super with separators, of which there are various types, inserted between them. The object of the separators being the prevent the bees building burr comb between the sections.

A method recently described by Mr. F. R. Beuhne to induce the bees to enter and start the sections is as follows:—

Remove a section holder from the shallow super and stand the latter aside, then take a comb of brood from the centre of the bottom box, attach to the bottom bar of the frame a piece of board the size of a shallow frame (without the projecting lugs), then replace the section super on the hive, and hang the brood comb, with board attached into it. This will expose some of the brood in the section super, and the bees will at once crowd up and build comb in the section alongside the brood. When comb building is well under way the brood comb is removed, the board detached from it, and the frame put back into the brood chamber. It is necessary to attach to the frame the piece of board mentioned when it is first hung through the half super to prevent the bees building comb into the space below the raised frame.

By means of this method, bees can be induced to work in sections when otherwise they would sulk or swarm.

THE PEANUT.

(*Arachis hypogea.*)

ITS CULTIVATION IN WESTERN AUSTRALIA.

F. J. S. WISE,
Adviser in Tropical Agriculture.

Never, in this State, was the time more opportune for an expansion of the peanut growing industry than the present. This is due to the fact that the price of first-quality peanuts is £84 per ton, largely because the Australian grower is assisted with a tariff of 4d. per lb. for peanuts in the shell and 6d. per lb. for the thrashed kernels. In this respect the American grower, who is able to compete successfully with Chinese grown nuts, is not assisted to anything like the same extent. The relative tariffs are as follows:—

Peanuts in the shell—

American—£1 14s. 6d. per ton.
Australian—£37 6s. 8d. per ton.

Kernels—

American—£3 9s. 0d. per ton.
Australian—£56 0s. 0d. per ton.

Nuts are graded into—(1) Confectionery, (2) Roasting, and (3) Milling. Among the uses of the oil obtained from milling the nuts are finest, for salads, oil, medicinal purposes, and as a high speed lubricant; first quality, for cooking and for the manufacture of margarine; the lower grades for soap making and other industrial purposes.

Ten years ago the Commonwealth imported 4,000 tons of nuts and 56,000 gallons of oil worth £36,000; last year the total importations of peanuts and peanut products exceeded £20,000 in spite of the heavy tariff. France alone manufactures 40,000,000 gallons annually from imported nuts. America has 120,000 growers producing 600,000 tons of nuts annually.

The Bureau of Agriculture at Washington states that peanuts give a higher monetary return than any other crop in the Southern States.

Where conditions of soil, rainfall and climate suit the production of this crop, and where transportation is not a prohibitive item, we have a certain local market to satisfy, with, at present, little danger of over production. Where conditions suit, it is a farm crop of considerable economic importance, for the plant being a legume it is a most desirable crop for soil renovating or improvement, as well as being a highly nutritious fodder.

DESCRIPTION.

The peanut (*Arachis hypogea*), also frequently known as the earth nut, is a plant belonging to the natural order Leguminosae, which are podbearers, and in common with most other members of the family has the power to obtain its nitrogen supply from the air. Its rootlets contain nodules or tubercles of various sizes, and these nodules contain millions of organisms which have the power to collect free nitrogen, and storing it within the tubercle it is rendered available to the plant and supplements the nitrogen from the soil.

Unlike other legumes, this plant, while blooming above the ground, matures its fruit or pods under the surface of the soil.

The yellow and sometimes pink flowers are borne at the joints of the stem in the case of the bunch varieties, at the base of the plant; in the creeper or procumbent varieties, right along the stems. When pollination takes place the flower fades and falls off, leaving the stem with a thickened pointed end, called the "point" or "peg," which grows down into the soil, where it matures the pod or so-called nut.

CLIMATE.

Although considered a crop for tropical countries and latitudes, the peanut will thrive under a wide range of climatic conditions, in fact, the world's crops are produced in sub-tropical zones. While in the cooler parts of this State it would succeed only in the summer, in the tropical portions it may be grown at any period where a sufficiency of rain falls. Ideal climatic conditions would be an early spring, comparatively high temperature, a moderate rainfall, plenty of sunshine, and a dry autumn or harvesting period that a minimum of loss would be occasioned through weathering and discolouration of the shells. The crop is very susceptible to frost, and a climate with freedom from frost for at least five months of the year is necessary. Departures from these conditions will result in a more lengthened period of growth. The crop can also be grown under irrigation, and it is very possible that as a rotation for the tomato growers of Geraldton and Carnarvon no better selection could be made.

PERIOD OF GROWTH.

The period of growth varies according to the variety and the climate, the upright or bunch varieties usually occupying fifteen to sixteen weeks, and the creeper or procumbent sorts from eighteen to twenty-two weeks to reach maturity.

SOILS.

The nature of the soil and its fertility is the greatest factor in a profitable crop. A sandy loam, of good lime content and reasonably rich in humus, may be regarded as ideal. A heavy soil, though kept in a friable condition and producing heavy crops, often causes great losses at harvest times owing to the difficulty in releasing the nuts from the soil. It is apparent from the brief description of the manner in which the nuts form that a loose surface texture is very desirable to allow the pegs to penetrate the soil and expend to form the pods, to mature evenly, and to permit of easy harvesting. Good drainage is very essential. The clean bright shell, produced in a sandy loam, being more inviting than stained shells from heavy soils even though the kernels are of no better quality, will naturally command a better price.

Preparation of the Soil.—In preparing the land for peanuts, if the soil is a free loam, the first ploughing should be deep, without bringing up any subsoil, and the second should not be more than five inches. This surface five inches should be brought to the best state of tilth possible, and kept well cultivated until ready for planting.

VARIETIES.

The best varieties are the large white shelled creeper sorts, being much more in demand for both confections and for margarine. The best commercial nut in Australia at the moment is the large white, imported a few years ago from Rhodesia, and which is now available at Darwin and through the usual seed merchants. The bunch varieties of Virginia (notably the Virginian Red Cross and Florida Bunch) are excellent croppers, and for a trade where a smaller nut is not objected to, can be highly recommended. Where it is desired to save the tops for fodder, the upright growers are the best.

SELECTION OF SEED.

Only best and sound kernels should be planted, and in common with other crops poor seed cannot be expected to give a good return. When selecting own seed, select heavy yielders or even maturity, and allow the nuts to remain on the plants for several weeks after curing. A special seed patch is desirable, selecting only the best, picked over by hand, and thoroughly dried and stored against weevil attack. Benzine drums are most satisfactory for seed storage.

METHODS AND TIME OF PLANTING.

According to the climates of the various districts, so must the time of planting vary.

In cooler districts plantings may be made as soon as all danger of frosts is over, and when the soil is getting warmer. In the tropics the crop can be grown at any period to suit the most certain rainfall months, perhaps late January and February would suit best, as long as sufficient rain can be depended upon to mature the crop and fine weather be expected at harvesting time. If large areas

are to be planted it is advisable to consider the area it is possible to handle daily at harvest time, and arrange successive plantings accordingly. Peanuts allowed to remain in the ground after maturity are easily detached from the plants, and in consequence a large number are not gathered, and there is also the danger of sprouting.

The seed can be planted either whole or shelled. Some growers favour soaking whole nuts to accelerate germination, but experience has proved that shelled seed is a distinct advantage. With shelled seed there is no danger of "duds" being planted, consequently a more even patch and crop results.

The seed may also be planted with a special plate in an ordinary planter, and in addition germination is more even and takes place days earlier. With shelled nuts germination takes about five days.

Quantity of Seed.—To sow an acre the amount of seed required is about 40 pounds of the whole nuts and from 20 to 30 pounds of shelled nuts, varying according to the weight of the nut and the spacing adopted in planting. Some growers use as much as 60 pounds per acre of the large podded varieties.

Planting may be done with a combined drill, or by hand. If by hand, drills should be run out 36 to 48 inches apart, according to the cultivating implement to be used. Upright varieties may be planted closer. The seed to be dropped: bunch varieties eight to 12 inches apart in the row, and creeper varieties 10 to 20 inches. The seed should not be covered more than 1½ to 3 inches, according to the condition of the soil and the moisture present. Where planting is done by hand, cover with a light harrow.

Fertilisers.—Where necessary and desirable to use fertilisers, very little nitrogen is necessary. In common with all legumes, peanuts thrive best where there is a sufficiency of lime. Even where the lime content is good, in soils which give a slight acid reaction, the application of half a ton of burnt lime or one ton of ground limestone broadcasted and harrowed (not ploughed) in will be very beneficial, preferably applied a few weeks before planting.

Of commercial fertilisers, one with a formula of 0-14-8 or 2-12-6 in quantities of not more than six cwt. per acre, or the following mixture per acre:—2 cwt. superphosphate, 1 cwt. sulphate of potash, 1 cwt. meatworks manure is best.

If any organic manure is applied it should be well rotted, and then only in small quantities. Fresh organic manures will cause the pods to be poorly filled, and will increase the "duds."

Apply the fertiliser lightly along the drill by hand or very close to the rows, as the peanut roots cover a narrow radius.

CULTIVATION.

Thorough and frequent cultivation is advisable. Early cultivation with narrow tines and with the cultivator close up to the plants, but after the plants have spread, and especially after flowering they should not be disturbed, and interrow cultivation should then be confined to the centre of the rows. Slight hilling is best practised during each cultivation to permit the "pegs" to easily enter the soil, but on no account should the earth be thrown into the centre of the plant. After-cultivation with broad tines ordinary hilling attachments will form a fine

surface mulch for the nuts to form in. Where being grown under irrigation, inter-row cultivation between weekly and fortnightly waterings is essential. Watering should on no account be continued later than four weeks after flowering. Constant cultivation will then give best results.

YIELD.

Though phenomenal yields of three tons per acre have been recorded in Australia, a yield of 15 cwt. may be taken as a fair average yield.

DROUGHT RESISTANCE.

This crop has the ability to withstand severe dry weather conditions when well established, and on the other hand, provided the land is well drained, will stand up to excessive rains.

HARVESTING.

When the normal period of maturity has been reached the plants will assume a yellowish colour, and on examination the majority of the nuts will be found to be fully grown, and the inside of the shell will show darkened veins. The crop is then ready to lift. Too early harvesting will result in a high percentage of empty shells and shrivelled kernels. On the other hand, if the crop is left too long, a big proportion of the crop will be left in the ground, and in the case of fodder, from the tops many of the leaves will have fallen. In friable soils the plants are readily lifted by hand, in heavy soils the assistance of digging forks or of a suitable digger with finger bars instead of a mouldboard, must be sought.

After lifting the plant and shaking the soil from the nuts, the plants should be left lying in small bunches until the leaves are well wilted, but not brittle. This is usually only a matter of a few hours if the weather is favourable. They should then be gathered into larger stacks in the field, if the acreage is large, stacking around suitable poles with cross pieces attached, is the best method. With open stacking, the best method is to pile in the form of a hollow circle, with nuts inward, and if not stacked too closely the circulation of the air dries the nuts, and at the same time the tops are cured. After two or three weeks in the paddock they may be safely stored in the barn, *but it is advisable to allow curing and maturing to continue for at least another month.* Nuts picked from the vines too soon are not thoroughly matured, and in consequence the kernels are shrivelled.

Hand picking has been the main system in vogue through the ages, and is still the only system practised in China, India, and Japan.

Excellent machines for all stages of the industry are manufactured in America. Two types of American machines for threshing or picking the nuts from the vine have been imported into the Eastern States, one working on the principle of a cylinder grain thresher, the other, one in which the plants are passed over a conveyor and drawn between spring points over a wire mesh, causing the nuts to fall on to a belt which conveys them to the winnower and grader. Several machines of the latter type are being successfully used in Queensland, and they have the advantage of being on wheels, and are drawn from farm to farm.

For hand picking or threshing the best plan is to beat the nuts across a board or tightly drawn wires in the case of the bunch nuts, and with creeper nuts

to rub the whole plant through fine mesh wire netting, tightly drawn over a box, when subsequent winnowing will remove trash and light shells. The leaves and light pods form an excellent forage.

MARKETING.

The nuts are usually bagged whole for shipment to the buyer. Breaking of shells and bruising of kernels should be avoided, as decomposition soon sets in with damaged nuts, and weevils are more likely to become a pest. Where shelled kernels are marketed great care should be exercised, and they should be kept absolutely dry.

PESTS AND DISEASES.

Insect pests are not of frequent occurrence, though grasshoppers at times cause damage, and mealy bugs have also been found on occasional roots.

The most common disease is a form of leaf spot (*Cercospera Sp.*), which appears as a brownish spot, and is usually found where conditions of bad drainage prevail. In the main it may be said that the most common troubles met with in this crop are due to conditions and not diseases, and caused through unsuitable soils or locations.

A NEW FRUIT FLY LURE—PRELIMINARY REPORT.

L. J. NEWMAN,
Entomologist.

In continuance of our search for more effective lures for the capture and control of the Mediterranean Fruit Fly, many experiments have been made.

The preparation which has given excellent results is the proprietary article known under the trade name of "Clensel." This had been previously used as a successful contact spray for other insects. It has a very pronounced appeal to the olfactory senses of this particular fruit fly, proving an irresistible lure. Up to the making of this discovery, the departmental pollard and borax lure had given the best results.

The experiments were commenced in May and have been continued throughout the wet season to the end of August. The tests are to be continued for a period of 12 months, when the final results will be published. It has undoubtedly proved a successful winter trapping medium, but how it will act as a summer lure during the hotter dry weather, and in face of the counter odours of the various fruits in season has yet to be determined.

The odour given off when mixed with water is very pleasant and certainly proves attractive to the fruit fly. How it will appeal to other species of fruit fly can only be answered by testing. Fortunately, *Ceratitis capitata* is the only species with which we have to contend.

In the trials made, the pollard lure was used as a control.

The *modus operandi* was as follows:—Various strengths of "Clensel," ranging from 1 in 20 to 1 in 80 of water, were tried out. In each tree, two traps each of

"Clensel" and pollard lures were used, in citrus trees, being hung alternately. Every seven days the traps were examined and the total capture of fruit flies, males and females, recorded. The lures were renewed every seven days. The number of traps used in the experiment were 10 of "Clensel" and 10 of pollard and borax.

To date, the "Clensel" lure has given practically a 2½ times better capture of fruit flies than the pollard control. The figures for the period May to August were, "Clensel" 1,524 flies, pollard 604 flies. The strength at which this lure is recommended is 1 part to 30 parts of water. The lure should be renewed every 7-10 days. During this test, glass traps v. tins were tried out. The glass jars have shown a slight advantage over the tins. There are, however, other good reasons why glass jars are preferable to tins. The jars never rust, always retaining their bright appearance, which is a factor in luring the fruit flies. They are more easily cleaned. The third important factor in favour of their use is, that the operator can readily see, by looking through the glass, the results of his trapping efforts and thus becomes enthusiastic.

It will be observed that this capture of 2,128 fruit flies has been made during the winter months when most growers, in spite of repeated appeals, discontinue their efforts against this pest.

If the public would make greater efforts during the winter and spring to capture the over-wintering fruit flies, a very severe checking blow could be dealt this virile fly.

THE DOUBLE GEE

(*Emex australis,* Steinh.).

C. A. GARDNER,
Government Botanist.

Most people are familiar with this weed, common to many parts of Australia. Its characteristic three-spined fruits adhere to or penetrate most things with which they come into contact, and they are so hard and rigid that they enter with ease the hardest skin. The name is derived from Dubbeltge—Doorn, an Afrikaan name meaning Devil's thorn. The plant is also sometimes known here as Cape Spinach, because it was introduced from Cape Colony, and when boiled as a spinach it is said to create an appetite, and is also mildly purgative and diuretic.

F. Turner, writing in the "Sydney Morning Herald" of 7th December, 1912, says: "In 1830 the ship "Margaret" left Bristol, England, with passengers for the Swan River Settlement, and during the voyage called at Capetown, South Africa, where one of the intending settlers procured some seeds of the so-called Cape Spinach, a plant known to botanists as *Emex australis,* with a view of cultivating it in the land of his adoption. In due course the seeds were sown in a garden and the resulting plants grew vigorously, but, instead of being a useful vegetable it has proved to be one of the most obnoxious and aggressive weed pests ever acclimatised in Australia." The plant spread mostly in the coastal areas towards Champion Bay. As the Murchison and Gascoyne areas were settled the stock introduced the seeds of this pest, and now it is to be found in all of our pastoral areas from the Kimberleys southwards. Stock serve as the principal agents in the dispersal of the weed, but rubber-tyred vehicles are also an important means by which the plant is carried into new districts.

The Double Gee is now known from all the Australian States. For many years (until about 1870) it was confined to Western Australia, but it then appeared in South Australia where it became known as "Prickly Jack." From there it spread

Double Gee (*Emex australis*).

into Victoria and New South Wales at a later date, being known as "Three-cornered Jack" or "Cat's Head." Later still J. F. Bailey recorded it from Queensland in 1911. At the present time the weed is a declared noxious weed in the Gingin,

Toodyay, Wickepin and Yilgarn Road Board areas, and in the Broome Ward of the Broome Roads District.

The seeds of this plant rarely if ever detach themselves from the spiny fruits. These fruits are only carried by some animal or mechanical agency, so that plants are only likely to appear in districts where the weed is unknown through the agency of introduced stock. The plant being an annual can be controlled providing it is eradicated before it is allowed to seed, and since this may occur at an early stage of its growth, the plants should be destroyed upon sight by cutting through the tap-root just below the crown, *i.e.*, an inch or two below the soil level. A hoe is useful in this respect, and in the Murchison district where the seriousness of the weed is more apparent than elsewhere, good results have been obtained by individual efforts, squatters carrying around with them small hoes like walking sticks, with which they cut off every plant seen. The plants will germinate freely after winter, spring or summer rains. Once established the plant is very hardy, and does not die off until it has seeded. It is of course most important that the eradication of the weed should be carried out as soon as the plant is recognised, since it may spread to an alarming extent in the course of a year or two if unchecked.

Description of Plant.

A vigorous spreading glabrous annual with rather fleshy prostrate or ascending stems radiating in all directions. Taproot long and thick. Leaves mainly ovate or ovate-triangular, sub-cordate or truncate at the base; the basal leaves usually the largest on long leaf-stalks, the upper ones gradually smaller, or with shorter leaf-stalks. The flowers are of distinct sexes. The males, consisting of a 5-6-lobed perianth and 4-6 stamens, are borne in oblong racemes in the upper leaf axils, often with a few females at the base. The females are usually congregated in the leaf-axils, and are almost sessile. The female perianth consists of six segments of which the outer three develop into the spines of the fruit, the inner three remaining erect and connivent in a pyramid at the summit of the fruit. The fruit is hard and very durable; when shed it lies on the soil with one spine uppermost. It contains one seed which is 3-angled, and rarely, if ever, shed from the fruit. For further particulars see plate.

COMBINED SPRAY FOR THE DESTRUCTION OF THE CLOVER SPRINGTAIL (LUCERNE FLEA) (*Smynthuris viridis*), AND THE RED-LEGGED EARTH MITE (*Penthaleus destructor*).

By L. J. NEWMAN,
Entomologist.

During the past winter a series of spraying experiments have been made with the view of discovering a cheap and effective spray for the dual purpose of destroying the two above-mentioned pests.

In a great proportion of instances both the Springtail and the Mite are found in association, the exception being our sandy coastal lands and the drier inland areas which are not suitable to the propagation of the Springtail. The Mite appears to flourish upon light or heavy lands as long as the weather remains showery and cool.

Several proprietary sprays were tested, but although effective killers, were too expensive to use over large areas. The great difficulty in the control of these pasture pests is not what will kill them, but what it will cost to accomplish this purpose.

It has been proved by experiments that lime and sulphurwash is very effective against the Springtail at a strength of 1 part of concentrated spray to 50 parts of water. This, however, did not have any great checking effect upon the Red-Legged Earth Mite. Unless a combined spray could be used, it meant that two separate applications had to be made to any area infested with both pests. To this end we have demonstrated that the following mixture is effective and is economically possible of application to large areas:—

Lime and sulphur concentrated, 5 gallons; Izal, 1 gallon; water, 250 gallons. For smaller lots take 1 pint of Izal, 5 pints of lime sulphur and mix together in 31 gallons of water.

For the Springtail only, use 1 part of lime sulphur wash to 50 parts of water.

The Izal readily mixes with the lime sulphur.

In practice it was found that 60 gallons of the spray was sufficient for an acre of early pasture, the amount necessary increasing as the season advanced and the weed growth increased. The cost of the material works out at slightly less than one penny per gallon, or roughly 5s. per acre.

There is every reason to believe that the application of this spray some time in May, after the Springtails and Mites have made their first appearance, that great destruction of these serious clover pests would follow. If left later, the growth of weeds and grass render the work more difficult.

An important point in connection with the use of this spray is the fact that it is non-poisonous. Cattle and sheep will readily feed over pasture sprayed with lime sulphur, but when the Izal is added, they do not relish the feed for two or three days.

MARKET REPORT.

Messrs. H. J. Wigmore and Co., Ltd., of Wellington Street, Perth, have supplied us with the following information regarding Chaff available at the Metropolitan Chaff and Grain Auction Sales held in Perth for the period June to August (inclusive). In all cases the price quoted is for f.a.q. to prime Wheaten Chaff, packed in new bags.

	Quantity.	Maximum.	Minimum.
June	1,050 tons	£5 5 0	£5 0 0
July	990 tons	£5 5 0	£4 10 0
August	1,060 tons	£4 10 0	£4 5 0

The period under review has been very disappointing from a grower's standpoint; quantities under f.a.q. to prime have been very difficult to quit at reasonable prices. At the time of going to press the market value for f.a.q. to prime is from £4 5s. to £4 7s. 6d., f.a.q. from £3 15s. to £3 17s. 6d., and in some cases this quality is selling at £3 12s. 6d. Mediums are in very poor request at as low as from £3 5s. to £3 7s. 6d., damaged and inferior down as low as £3 per ton.

Oaten Chaff.—During the past three months heavy supplies were available and low prices had to be accepted. During June and July f.a.q. was selling at

£4 5s. to £4 15s., and during August this quality was realising from £4 to £4 2s. 6d. per ton. At the time of going to press f.a.q. is selling at from £3 17s. 6d. to £4, medium qualities at from £3 5s. to £3 10s. per ton.

Oats.—The market has been over-supplied, and with a lesser demand auctioneers have been forced to quit consignments at very low rates, the under-mentioned being the closing quotations:—

June and July—
Good heavy feed Algerian or Guyras—2s. 2d. to 2s. 3d. per bushel.
Medium feeds—1s. 9d. to 1s. 10d. per bushel.

August—
Good heavy feed Algerian or Guyras—1s. 9d. to 1s. 10d. per bushel.
Medium feeds—1s. 5d. to 1s. 6d. per bushel.

Wheat.—During the months of June and July f.a.q. was realising from 4s. 3d. to 4s. 8d. per bushel, but during August the market eased in sympathy with overseas prices, f.a.q. selling at auction at from 3s. 10d. to 4s. 2½d. At the time of going to press, however, the market has eased still further, f.a.q. selling at from 3s. 3½d. to 3s. 6d., quality approaching this at from 3s. 1d. to 3s. 2d., second grade at from 2s. 11d. to 3s., cracked grain selling at from 2s. 9d. to 2s. 10d. per bushel, smutty and inferior at lower prices according to sample.

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS, FOR MONTHS OF JUNE, JULY, AND AUGUST, 1930.

	June.				July.					August.			
	4th.	11th.	18th.	25th.	2nd.	9th.	16th.	23rd.	30th.	6th.	13th.	20th.	27th.
Sheep ...	10,820	9,479	10,447	9,948	13,209	12,872	15,410	14,951	13,289	9,880	13,435	13,885	16,116
Cattle ...	820	760	809	760	885	773	682	592	571	819	813	612	940
Pigs ...	879	815	803	756	962	687	678	720	923	1,251	1,083	1,144	1,331

COMPARATIVE VALUES PER POUND.

	June.				July.					August.			
	4th.	11th.	18th.	25th.	2nd.	9th.	16th.	23rd.	30th.	6th.	13th.	20th.	27th.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Mutton	5	5½	5½	6	6	6	6	5	5	5½	5	5½	5
Beef ...	7	7¼	6	5½	6½	6½	7	7½	6½	6¾	6½	6	5
Pork ...	8¾	9	9	9¾	9¼	9¼	9½	9½	9½	9	8½	8	7¾
Bacon ...	8¼	8	8	8	7¾	7½	7½	7½	7¾	7¾	7¾	7¾	7½

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	JUNE, 1930.						JULY, 1930.						AUGUST, 1930.					
					inches.	inches.					inches.	inches.					inches.	inches.
Chapman State Farm	68·4	73·2	53·8	48·5	9·15	4·18	65·3	71·6	47·3	40·3	4·60	3·97	67·4	77·0	46·9	39·2	1·59	2·68
Geraldton	70·3	77·0	59·6	54·2	9·37	4·76	67·9	74·2	52·9	40·4	3·86	3·90	68·9	76·2	53·4	41·2	1·57	2·88
Walebing	64·5	69·0	51·1	43·0	7·95	3·98	62·8	70·0	42·7	36·0	4·61	3·72	63·4	74·7	46·8	54·6	3·71	3·02
Perth	66·3	71·4	54·0	48·0	11·35	6·96	63·9	69·9	48·6	41·0	10·17	6·64	63·8	72·4	49·7	4·10	4·89	5·73
Kalamunda	63·1	68·0	51·0	45·2	12·44	8·11	62·0	66·0	47·1	42·0	15·24	8·13	57·9	67·2	48·8	41·8	5·87	6·85
Bunbury	65·6	71·0	53·2	40·0	11·42	7·21	63·1	67·5	48·6	40·0	5·17	6·93	63·6	68·0	47·7	39·0	...	5·35
Bridgetown	63·6	71·0	47·3	36·0	9·43	5·82	61·1	67·2	40·8	32·2	7·02	5·77	62·2	70·0	41·2	28·8	3·33	5·10
Albany	64·4	71·8	50·9	45·0	3·23	5·51	62·4	69·0	46·5	39·0	6·12	5·54	62·6	71·0	47·0	41·0	3·96	5·19
Merredin State Farm	63·5	70·0	50·9	43·7	3·63	1·86	59·8	67·9	41·0	30·8	1·37	1·90	61·5	73·0	42·9	29·5	1·84	1·37
Northam	66·1	72·5	49·9	44·2	5·25	3·28	63·3	70·0	43·2	35·6	4·51	3·46	63·8	74·1	44·7	34·0	2·61	2·55
York	65·3	71·0	50·2	42·0	4·99	3·34	62·5	69·6	43·1	35·0	5·01	3·39	63·8	72·5	43·6	34·0	2·43	2·80
Narrogin State Farm	61·2	68·8	47·5	37·7	5·64	3·66	59·1	65·6	41·7	34·5	7·80	4·11	60·2	67·8	42·3	33·2	1·52	3·17
Katanning	61·0	68·1	49·0	37·0	5·75	2·88	58·5	65·1	44·3	37·3	4·31	3·05	60·4	67·4	44·8	37·0	1·02	2·48
Cape Leeuwin ...	63·9	70·0	55·5	48·8	8·61	6·85	61·6	67·0	53·0	44·0	8·17	7·25	61·4	69·0	52·5	44·0	3·97	5·28

PRODUCERS' MARKETS CO-OPERATIVE, LTD.

Report as under for quarter ending 10th September, 1930:—

Fruit was well supplied throughout with every variety in season. Tomatoes ex-Geraldton commenced in July with fair values, and have since increased in volume. Prices this year, in comparison with a similar period of last year, are very low. This is probably due to unfavourable weather and financial depression. Citrus growers commenced with fair values but excessive rain and wind caused the majority of their fruit to fall, and the market was consequently over supplied. During the last month, however, prices have improved, and growers still having navels to market should realise high values. Lemons remained unsettled throughout, but prime mandarins were always in demand. Apples have remained steady throughout; early Jonathans being well supplied with values firm. With the exception of a few prime lines values remained fair until the middle of August, when they dropped 2s. to 3s. on all varieties. The market for grapefruit has been exceptionally firm this season, prices realising up to 22s. 9d. per bushel case. Cape-gooseberries realised satisfactory prices, with passion fruit short supplied and selling to a good demand.

Vegetables.—Supplies at the beginning of the quarter were only fair, bunch lines being very short, but equal to the demand. Cabbage values were firm with good supplies forward. Country potatoes were forwarded to a weak demand, many badly graded lines being noticeable. Cauliflowers continued heavy, but the quality for the most part was poor, improving, however, towards the end of last month. Values for peas and beans were firm.

Eggs.—Early June saw increased supplies, which remained steady throughout the month with values unaltered. New-laid hen eggs selling at 1s. 7d. to 1s. 11d. Increasing supplies, however, caused prices to drop considerably, with the demand good.

Poultry.—At the beginning of the quarter the demand for prime quality was keen and values maintained. Early August saw values for turkeys slightly lower, but other lines remained unaltered. Prices are now firming for nearly every line, with the exception of turkeys.

Carcase Meat.—Early June good supplies with veal in demand. Towards the middle of July there was an improved demand for veal, and also pork on account of short offerings. Lamb also plentiful at late ruling rates.

WESTERN AUSTRALIA—DEPARTMENT OF AGRICULTURE.

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No. 20.—*The Pruning of Fruit Trees.* J. F. Moody. Price 2s. 6d.
No. 24.—*Hints to Stock Breeders* (revised). R. E. Weir.
No. 30.—*Descriptive Account of the Codlin Moth.* L. J. Newman.
No. 37.—*Conference of Producers,* 1910 *and* 1912.
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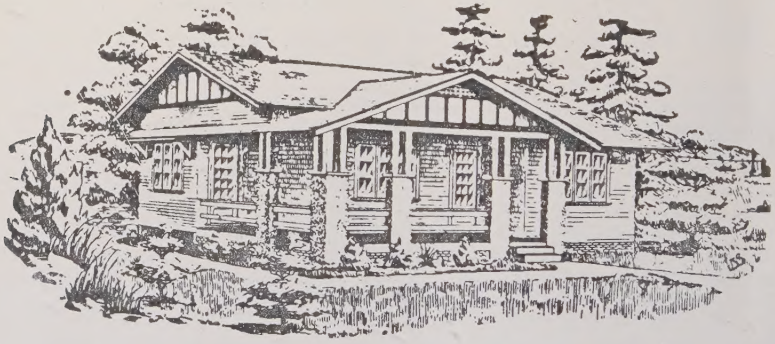

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